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THE

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OF THE

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THE OTTAWA NATURALIST

VOL. XXI.

OTTAWA, APRIL, 1908

No. 1

THE REPORT OF THE COUNCIL OF THE OTTAWA FIELD-NATURALISTS' CLUB FOR THE YEAR ENDING MARCH 17TH, 1908.

MEMBERSHIP.

During the year thirty-nine new members have been elected, making the present membership 291, composed of 283 ordinary members and eight corresponding members.

SOIRÉES.

No more successful series of lectures has ever been provided by the Club than that of the past winter. Every subject was of popular interest, the addresses were all able efforts, the programme was carried out exactly as printed, and the attendance throughout the entire course was most gratifying. Reports of the work done by the various branches during the year were presented at the different meetings; and in this way, the aims of the Club were kept before the public.

The opening soirée was held on December 10th in the Normal School. It is a time-honored custom of the Club to make the first meeting the occasion for an annual re-union of members; and to this end the programme is of a rather informal nature. An exhibition of specimens has become a feature of the opening night as providing a centre of interest and an opportunity for the exchange of personal experiences, as well as giving the leaders a means of becoming acquainted with new members and those interested in the subjects of the lecture course.

Principal White of the Normal School delivered an address of welcome. Five of the older members, most of them past presidents, recounted personal experiences in the field during the past season. Dr. S. B. Sinclair described successful methods employed by his party in fighting a stubborn bush fire in the Parry Sound District. This address was of so great merit that it was secured by the Canadian Forestry Journal and has since been published in that organ. Dr. Fletcher, whose word pictures have made the Club familiar with the Rockies, described the

"Mountain Sprites" that allure the entomologist to their wind-swept homes. Dr. Ami, who represented the Geological Survey at the Centenary of the Geological Society of London, recounted interesting incidents of that gathering. Prof. F. T. Shutt followed with a paper on "Rain and Snow," describing the influence of these elements of nature in the industrial world, in the agricultural world, and upon the health of the race. Mr. Halkett, who spent the summer collecting in Alberta and Saskatchewan, submitted a list of the fishes of these two provinces, and described many interesting features of the birds and mammals observed.

At the second soirée, held on January 7th, Dr. P. H. Bryce delivered an address on "Some Sanitary Considerations in the Construction, Heating, and Ventilation of Dwellings." A verbatim report of this able address will appear in an early number of THE OTTAWA NATURALIST.

The programme for January 21st brought out a large audience including several local apiarists. Mr. P. H. Selwyn gave an address on "The Life and Work of the Honey Bee, as observed from Spring to Fall," and Dr. Fletcher spoke of "The Honey Bee and Other Bees." Both addresses were published almost in full in the February number of THE OTTAWA NATURALIST.

On February 4th the President, Mr. W. J. Wilson, described "The Height of Land Country between the St. Lawrence and the Hudson Bay Waters." He showed a map of the country and explained the various topographical features, mentioning that there are large areas of good clay soil, but also much swamp and muskeg. He described, and illustrated by means of lantern slides, the various types of forest covering the country. The Height of Land is rather a broad plateau than a sharp dividing ridge. The rivers flowing from this plateau descend several hundred feet before they reach the coastal plain; and in this distance, they form many waterfalls which can be made to produce almost unlimited power. The lecturer illustrated the mode of travel, described the Indians of the district, and spoke of the abundance of fish, especially the speckled trout, with which most of the rivers teem.

At the following soirée, held on February 18th, Dr. Chas. Saunders, Cerealist, Dominion Experimental Farms, gave a valuable address on "Wheat, its Improvement and Uses." After pointing out the reasons for the steady increase in the popularity of wheat as human food, the lecturer discussed the methods available for the improvement of this cereal, especially those employed on the Experimental Farms. The operations of cross fertilization and selection were illustrated by lantern

slides and clearly explained. The uses of the various types of wheat were pointed out, and some account was given of the milling and baking tests carried on by the lecturer in determining the value of different varieties.

On March 3rd, a large audience, including many members of the teaching staffs of the city, heard Dr. John Brittain of Macdonald College discuss "The Time and Place for Nature Study in the Public Schools." The lecturer made a strong plea for the introduction of Nature Study in the lower grades. At the conclusion of his address proper, Dr. Brittain gave a practical demonstration of Nature Study methods by teaching a lesson, replete with simple experiments, on "The Composition of Wood."

The final lecture of the course, "What is the Shamrock?" is to be delivered this evening by Prof. John Macoun.

The Soirée Committee is usually fortunate enough to secure the services of some visiting scientist for a special lecture. On May 31st of this Club year, Prof. Chas. Pollard, Secretary of the Wild Flower Preservation Society of America, delivered an address before a large gathering in the Assembly Hall of the Normal School. The address was illustrated with more than a hundred hand-colored slides from the famous Van Brunt collection, perhaps the most beautiful ever shown before the Club. The older botanists of the Club comment on the number of species now locally extinct, due to the steady expansion of the city and the consequent destruction of such collecting grounds as "Stewart's Bush."

EXCURSIONS.

The following programme of excursions was drawn up:

April 20th, Rockliffe.

April 27th, Beechwood.

May 4th, Blueberry Point.

May 11th, Leamy's Lake.

May 18th, Tetrauville and Beaver Meadow.

May 25th, Victoria Park and Experimental Farm.

June 1st, General Excursion, Chelsea.

Sept. 14th, Beaver Meadow, Hull.

Sept. 21st, Queen's Park, Aylmer.

Sept. 28th, Rockliffe and Hemlock Lake.

The fact that only one excursion was cancelled is striking evidence of the dry weather conditions that prevailed throughout the season. The lateness of the spring is similarly emphasized in the published reports of the excursions by the constant mention of the unusually small numbers of birds and insects observed. The fall excursions, however, were held under very favorable conditions, and were so largely attended that the Council, by

request, continued the Saturday outings into the month of October.

The Council recommends that in future a programme of excursions for the entire season be drawn up at the first meeting of the Council, and that a printed copy of the programme be mailed to each member of the Club.

THE OTTAWA NATURALIST.

Volume XXI of THE OTTAWA NATURALIST, the official organ of the Club, has been published under the editorship of Mr. J. M. Macoun. It consists of twelve numbers paged 1-120 and 153-244, as explained on page 204. The numbers of this volume present a more attractive appearance than those of former years, due to the better quality of paper used and to the clearer letter-press. The distinctive characteristic of this year's publication, however, is the prominence given to the proceedings of the Club. Full reports of papers read at the soirées have been published, meetings of the Council have been reported, the discussions at the branch meetings have been excellently summarized and the lady members of the Club have written the most interesting accounts of excursions ever prepared for THE OTTAWA NATURALIST.

The following are among the papers that appear in this volume.

ON GEOLOGY.

1. "On a Tooth of *Ovibus* from Pleistocene Gravels near Midway, B.C.," Lawrence M. Lambe, F.G.S.
2. "Description of a Canadian Species of *Peltoceras*," Dr. J. F. Whiteaves.
3. "Notes on the Geology and Mineral Resources of Trinidad and the Barbados," Dr. R. W. Ells.
4. "On an Occurrence of *Hybocystis* in Ontario," W. A. Parks, Ph.D.

ON BOTANY.

1. "How the Seeds of Plants are Spread in Nature," Norman Criddle.
2. "Fungi from the Kawartha Lakes, including several new Species," Cephas Guillet.
3. "Notes on the Genus *Vaccinium* in British Columbia," E. Wilson.
4. "Some of the Influences Affecting Seed Production," W. T. Macoun.

ON ENTOMOLOGY.

1. "The Great Leopard Moth," Arthur Gibson.
2. "List of Coleoptera collected by Mr. J. M. Macoun in British Columbia."

3. "The Life History of the Honey Bee," Percy H. Selwyn.
4. "The Honey Bee and Other Bees," Dr. Jas. Fletcher.
5. "Mountain Sprites," Dr. Jas. Fletcher.

ON CONCHOLOGY.

1. "Marl Shells from Cobalt," Bryant Walker.

ON ORNITHOLOGY.

1. "Remarkably Early Arrival of the First Migrants of this Spring," Rev. C. W. G. Eifrig.
2. "New Brunswick Flycatchers," Wm. H. Moore.
3. "Spring Migration on the Bruce Peninsula," A. B. Klugh.
4. "Notes on Some Seal Island Birds," H. F. Tufts.
5. "The American Goshawk near Ottawa," Rev. C. W. G. Eifrig.
6. "How to Make a Bird Sanctuary Anywhere," C. de Blois Green.
7. "Dates of Arrivals of Birds at Camrose, Alta., in 1906 and 1907," F. L. Farley.
8. "Winter Birds in Montcalm County," L. M. Terrill.
9. "Dates of Departure in the Fall Migration of the More Common Birds of Ottawa," Rev. C. W. G. Eifrig.
10. "List of Sable Island Birds," James Bouteiller.
11. "Bird Notes from South-western Nova Scotia," H. F. Tufts.

ON ZOOLOGY.

1. "A New Mouse for Canada," W. E. Saunders.
2. "A Viviparous Snake," J. M. Macoun.

ON METEOROLOGY.

1. "Climate in Relation to Health," Dr. P. H. Bryce.
2. "The Weather," Dr. Otto Klotz.
3. "Rain and Snow," Prof. F. T. Shutt.

In addition to the above-named papers, the index pages will show numerous short notes sent in by collectors and observers from various parts of Canada. Much of the original work done by the individual members is reported at the branch meetings; and for this reason, the reports of these meetings will be found to contain a great deal of new information regarding the Ottawa district not specially mentioned in the index.

REPORTS OF BRANCHES.

The branches report a busy and successful year. The field work of the members of the Club, as the published notes show, extends over practically the entire Dominion. Some of the branches hold monthly or fortnightly meetings throughout the

winter for the discussion of questions belonging more particularly to their own departments. In the Botanical Branch, it is the custom for the host of the evening to present a paper dealing with his own personal researches in the field, or to introduce the discussion of some subject, after which the members take part in the general discussion, with the host acting as chairman. Other branches, for instance the Entomological Branch, expect each member present to furnish a small exhibit from his private collection, or to contribute in some other way to the programme of the evening.

THE ZOOLOGICAL BRANCH.

The Zoological Branch notes with pleasure the establishment of marine biological stations by the Dominion Government at St. Andrew's, N.B., and Departure Bay, B.C.

Prof. Prince gave an address at the May meeting of the Royal Society of Canada on Canadian Marine Biology. Mr. Halkett spent the summer collecting and observing in Alberta and Saskatchewan, devoting special attention to the fishes of those provinces, a list of which appears in the report of the branch. Mr. Lemieux made a capture of more than local interest on October 1st near the Chats Falls in a specimen of the milk snake (*Matrix sipedon*) which contained over forty young, each about eight inches in length. This extends the breeding season of this species to a later date than hitherto recorded. The most remarkable addition to local species is the soft-shelled turtle (*Trionyx spinifex*) from l'Ange Gardien, Que. Prof. Prince prepared two special government reports, "The Local Movements of Fishes," and "The Unutilized Fishery Products of Canada"; and Mr. Halkett prepared a report of the Canadian Fisheries Museum, dealing with the vertebrates in the Museum.

ORNITHOLOGICAL BRANCH.

The local ornithologists' report continued progress in their work on the local list. They also draw special attention to the abnormal records of the spring migration for 1907, as fully recorded in THE OTTAWA NATURALIST. An interesting feature of the report is the description of a Great Horned Owl sent in from Labelle County, pierced with scores of quills from a porcupine, which probably hunger had driven it to attack.

The branch invites all those interested in the study of birds to send their names and addresses to Mr. A. G. Kingston, 241 Nicholas Street, because in this section of field work, the co-operation of numbers is especially desirable. Finally, the branch makes an appeal for the protection of bird life. The

Massachusetts Board of Agriculture finds the domestic cat to be one of the worst foes of birds; and, in some German cities, cat-catchers are employed to rid the parks of these enemies. During the nesting season, at least, the house cat should be kept indoors.

GEOLOGICAL BRANCH.

The report of this branch contained a summary of the work done by members at the excursions of the Club. Additions to the lists of organic remains obtained from various localities in the Ottawa District, were recorded as well as interesting observations made in several of the geological formations in and about the city.

Records of work done by geologists in the Ottawa Valley before the advent of the Club were also given from the observations of Bigsley in 1822 at the limestone formation of the Chaudiere Falls, to the work of Sir Wm. Logan, Alexander Murray, James Richardson, Dr. Wilson of Perth, Sheriff Dickson of Pakenham, Rev. Mr. Bell of L'Orignal, and Elkanah Billings. Special reference was made to the work of Billings and the high esteem in which he was held. The Club had been instrumental in having a suitable portrait of the first Palæontologist of the Geological Survey painted and presented to the Survey.

The report pointed out many avenues of work still remaining open to members of this branch, and it suggested the formation of a Geological Club with the object of furthering the interests in common.

ENTOMOLOGICAL BRANCH.

The annual report of this branch shows a marvellous amount of work accomplished, when one considers that the past season was decidedly unfavorable from an entomological point of view. The work done by this branch is very systematic as most of the members are specialists, confining their efforts largely to some particular branch of entomology. The result of this intensive method is seen in the list of species new to the Ottawa district, practically every member of the branch having contributed to the additions.

Two interesting papers are promised for early publication. Dr. E. M. Walker is preparing one on the dragon-flies of the Ottawa district from specimens and data furnished by local collectors. The other paper will be contributed by Mr. W. D. Kearfott, the well-known specialist in microlepidoptera, as a result of collections made by himself and local members last June in the Ottawa district.

THE LIBRARY.

Your Council regrets to report that, in the remodelling of

the interior of the Normal School, the room formerly occupied by the Club as a Library has been converted into a cloak room, and that it has been necessary to remove the copies of THE OTTAWA NATURALIST and the unbound exchanges to a store-room in the basement of the Normal School. A Committee consisting of Dr. Jas. Fletcher, Dr. H. M. Ami, and Mr. A. H. Gallup, has been appointed to ascertain if a suitable room can be secured elsewhere.

The Library Committee appointed last year has had printed a uniform label for the bound volumes in the Carnegie Library. The Club has on hand 250 copies of each of the forty-two papers on Nature Study published in THE OTTAWA NATURALIST, and the Council is of the opinion that a number of these should be bound.

The Treasurer's report shows a balance on hand of \$197.24.

The President, Mr. W. J. Wilson, represented the Club at the May meeting of the Royal Society of Canada.

As in other years, several of the leading members have contributed to the lecture courses of various local societies.

A special bulletin on "Farm Weeds of Canada" was issued during the year by the Seed Branch of the Department of Agriculture. This bulletin was exclusively the work of three members of the Club, Mr. G. H. Clark, Seed Commissioner, Dr. Jas. Fletcher, Entomologist and Botanist, Dominion Experimental Farms, and Mr. Norman Criddle of Aweme, Man. This is undoubtedly one of the best government publications of its kind ever issued by any country.

The Club desires to express its hearty appreciation of the efforts of the Horticultural Society towards beautifying Ottawa; it likewise appreciates the kindness of Her Excellency the Countess of Grey, in making it possible for so many school-children of Ottawa to actively participate in flower-gardening at Rockcliffe under expert supervision.

The Ottawa Field-Naturalists' Club extends its best wishes to two new sister societies in the West, the Edmonton Natural History Society, and the Regina Natural History Society.

The thanks of the Club are again due to Principal White for kindly placing the Normal School at its disposal, to the Library Board of the City Council and the librarian, Mr. Burpee, for the use of the lecture hall of the Carnegie Library, and to the Press of the city for its co-operation in furthering the aims of the Club.

All of which is respectfully submitted.

T. E. CLARKE,
Secretary.

TREASURER'S STATEMENT FOR YEAR ENDING
17TH MARCH, 1908.

—
RECEIPTS.

Balance from previous year.....		\$48 63
Subscriptions—1907-1908.....	\$175 00	
Arrears.....	138 00	
	<hr/>	313 06
Advertisements in OTTAWA NATURALIST.....		103 50
Nature Study separates sold.....		75 02
OTTAWA NATURALISTS sold.....		50
Net proceeds, General Excursion to Chelsea, 1st June...		3 90
Government Grant.....		300 00
		<hr/>
		\$844 55

EXPENDITURE.

Printing OTTAWA NATURALIST, Vol. XXI, 12 Nos., 244 pages, including cover.....	\$375 48	
Illustrations.....	24 78	
Author's extras.....	25 15	
Miscellaneous printing—circulars, mailing envelopes, post cards, etc.....	42 50	
	<hr/>	\$467 91
Postage on OTTAWA NATURALIST.....	35 91	
Editor.....	50 00	
	<hr/>	\$553 82
Less 2 per cent. for cash on printers' accounts....	9 80	
	<hr/>	544 02
Secretary.....		25 00
Treasurer.....		25 00
Soirée expenses.....		31 25
Library expenses.....		3 76
Sundry expenses, postage, etc.		18 28
Balance.....		197 24
		<hr/>
		\$844 55

ARTHUR GIBSON, *Treasurer*,

Examined and found correct,

R. B. WHYTE, *Auditors.*
F. T. SHUTT,

Subscriptions for the new club year are now due, and should be paid at once.

It is to be hoped that members will carefully examine the advertisements in this volume of THE OTTAWA NATURALIST, and make a point of dealing with those firms who thus help the Club.

THE DRAGONFLIES (ODONATA) OF THE OTTAWA DISTRICT.

BY E. M. WALKER, B.A., M.B., Toronto

During the past year several small collections of Odonata or Dragonflies from the Ottawa district have been sent to the writer for determination, and at the request of Dr. Fletcher, from whom most of the material has been received, the following notes upon the species examined have been prepared, and are offered as a basis for future work in this field on the part of collectors in this locality.

To aid the novice in the determination of his captures, brief mention is made of the characters by which the various families, genera, and species may be most easily recognized, and figures of the characteristic parts are given where these are deemed preferable to verbal descriptions. At the same time the student is reminded that determinations made from such brief descriptions should not be considered final. They may enable him to classify his specimens in a preliminary way, but for accurate and reliable diagnoses recourse should be had to some of the more complete treatises on the group, of which the following will be found the most useful to the beginner:—

CALVERT, P. P. Catalogue of the Odonata of the vicinity of Philadelphia, with an introduction to the study of this group of insects. Trans. Am. Ent. Soc. 1893, XX, p. 152a-272.

KELICOTT, D. S. The Odonata of Ohio (a posthumous paper, completed and edited by J. S. Hine) Ohio State Acad. Sci., special papers, No. 2, 1889.

WILLIAMSON, E. B. The Dragonflies of Indiana. Dept. Geol. and Nat. Resources of Ind., 24th An. rep't., 1900, p. 233-333.

NEEDHAM, J. G. Aquatic Insects in the Adirondacks, Odonata. N.Y. State Museum, Bull. 47, 1901, p. 429-540.

NEEDHAM, J. G. Aquatic Insects in New York State. N.Y. State Museum, Bull. 68, Ent. 18, 1903, p. 218-279.

The collections which form the basis of the present paper were made by the following gentlemen: Dr. James Fletcher, Messrs. Arthur Gibson, J. Létourneau, W. H. Harrington, and C. H. Young, and the Rev. G. W. Taylor. Dr. Fletcher tells me that no systematic attempt has been made to collect all the species inhabiting the Ottawa district, but that the material consists chiefly of odd specimens picked up from time to time by the various collectors, while seeking specimens of other orders. This being the case the list, which embraces 47 species,

is a fairly good one, and the species comprising it indicate a great variety of aquatic environment. Species inhabiting the larger lakes and rivers, ponds, sluggish creeks and rapid streams are all represented.

Of these 47 species 42 range southward throughout Ontario, or have been taken in neighboring parts of the United States at moderate elevations. Seven or eight of these are more common in the upper Austral Zone, and probably do not range far into the Canadian Zone. The remaining five are more or less characteristic of the Boreal Zone.

The Dragonflies (order Odonata) are readily separable into two large groups or sub-orders, the Zygoptera or Damsel-flies, and the Anisoptera or Dragonflies proper.

The damsel-flies are mostly small delicate forms, with a slender abdomen and comparatively feeble powers of flight. They are easily known by the somewhat hammer-shaped head with its widely separated eyes, and by the fact that the two pairs of wings are similar in form, and in repose are held together in the vertical plane or only half spread.

The Anisoptera, on the other hand, are generally larger and more robust than the Zygoptera; the hind wings are broader than the fore pair, and are held in the horizontal position. The eyes are commonly larger and closer together frequently touching one another above.

Sub-order 1. ZYGOPTERA.

This sub-order contains but one family, the Agrionidæ, although Calopteryx and its allies are placed by some authors in a separate family.

Genus CALOPTERYX, Leach.

Comparatively large species with bright metallic green bodies and broad rounded wings, which, unlike those of our other damsel-flies, are partly or entirely clouded with dark brown or black. They frequent woodland streams, flitting along the banks like butterflies, or chasing each other over the water.

Two species occur in Ontario, and both have been met with at Ottawa.

1. CALOPTERYX MACULATA (Beauv.), Burm.

Ottawa, Hull, 3 males, 3 females (Gibson, Létourneau, Harrington, Young).

Length of body male, 46 mm., female, 52 mm.

Length of hind wing. 32 mm., " 36 mm.

Width of hind wing. 10 mm., " 10 mm.

This is the commoner of our two species of Calopteryx, and ranges throughout the southern part of the province and

northward at least 30 miles beyond the Soo. The male is easily known by its deep brown or black wings, those of the female being lighter brown, each with a white spot on the costal margin near the tip.

2. *CALOPTERYX AQUABILIS*, Say.

Ottawa, Hull, 2 males, 2 females (Gibson, Létourneau, Harrington, Young).

Length of body male, 50 mm., female, 52 mm.

Length of hind wing 32 mm., " 36 mm.

Width of hind wing 9 mm., " 10 mm.

As seen from the measurements this is a larger insect than *C. maculata*, and has relatively narrower wings. In the male these are clear with the apical fifth or less of the front pair, and about three-fifths of the hind pair black or dark brown, the depth of color as in the preceding species deepening and becoming better defined with age. In the female the whole wing is more or less suffused with brown, the apical portion only faintly deeper than the rest, except in old specimens where the contrast may be fairly well marked.

While often found in company with the preceding species, *aquabilis* prefers the larger streams, and is considerably warier and swifter of flight than its congener.

Genus *LESTES*, Leach.

The members of this genus are easily recognized in life by their habit of resting with the wings half spread. The genus is separated from the remaining genera of Agrionidæ by the position of the median sector, which arises nearer the arculus than the nodus (Fig. A). The superior appendages of the male form a pair of curved forceps, toothed along the inner margin, and these together with the inferior pair offer the best characters for the separation of the different species. These are mostly dark bronze-green or brown forms, the males having the last two joints of the abdomen and the space between the wings covered with a bluish white dust. The females of the different species are not readily separated, but can generally be recognized in the field by their associating with males of their own species.

3. *LESTES* CONGENER, Hagen. Fig. B.

Hull, September 14th, 1907, 1 male (Létourneau).

This is rather smaller than the other species of *Lestes* belonging to our fauna, and is somewhat local in its occurrence. It was common in Algonquin Park in 1903-04, and I have taken it at Nepigon and in Niagara Glen.

Its appendages resemble those of *L. eurinus*, which probably also inhabits Ontario, in that the inferior pair is not more than

half as long as the superior, but *curinus* is a large metallic green insect, while *congener* is small and dark bronzy-brown in color.

4. *LESTES UNGUICULATUS*, Hagen. Fig. C.

Ottawa, July 15th, 16th, 1907, 1 male, 5 females, all teneral except 1 male. (Gibson). July 30th, 1907, 4 males, 1 female (Gibson, Létourneau); 2 males, 2 females (Fletcher, Harrington); Clark's Bush, July 11th, 30th, 1907, 3 females (Létourneau).

Widely distributed in the United States and in Canada, ranges from Nova Scotia at least as far west as Regina, Saskatchewan.

The males are easily known by the sigmoid curve of the inferior appendages (Fig. C).

5. *LESTES UNCATUS*, Kirby. Fig. D.

Ottawa, June 26th, 1906, July 9th, 11th, 15th, 16th, 30th, 1907, 15 males, 4 females (Fletcher, Gibson, Létourneau, Taylor, Young); Clark's Bush, 1 male, July 11th, 1907. (Létourneau).

This appears to be the most abundant *Lestes* at Ottawa, though less so than the next species in most parts of the province of Ontario, where I have collected. It is a widespread species, and is very common in the Canadian Northwest. It is a rather robust metallic green form, and is easily distinguished from the other members of the genus by the broadly expanded apices of the inferior appendages of the male. The female is known by the robust form, metallic coloration, and the very narrow humeral thoracic band.

6. *LESTES DISJUNCTUS*, Selys. Fig. E.

Ottawa, August 1st, 1907, 1 male (Létourneau); 2 females (Fletcher).

This seems to be the commonest *Lestes* in Ontario, judging by my own experience in the field, but in the Ottawa district it would appear to be far outnumbered by *L. uncatus* and *unguiculatus*, if the relation between the numbers of specimens of these different species in the collections examined approximates that which obtains in life.

L. disjunctus is somewhat smaller and more slender than either of the other two forms mentioned, and the male is easily separated from them by the form of the appendages. The inner margin of the superior ones bears two acute teeth of nearly equal size, and the inferior pair reach beyond the second tooth, and are straight and scarcely at all dilated apically.

This species is somewhat difficult to separate from *L. forcipatus*, which may possibly also occur in the Ottawa district. In the male of *forcipatus* the second tooth of the upper appendage

is much smaller than the first, the inferior appendages are somewhat more dilated apically, and the antehumeral band is broader. It is also larger than *disjunctus*, as seen from the following measurements: *L. disjunctus*, length of abdomen, male 27-30.5 mm., female 26-29 mm. *L. forcipatus*, length of abdomen, male, 30-35 mm., female, 28-34 mm. (Calvert).

Two other Lestes, *L. rectangularis* and *L. vigilax*, are likely to be met with about Ottawa, and a third, *L. inequalis*, may perhaps occur there. *L. rectangularis*, which is common in Algonquin Park and generally distributed throughout most of the Province, may be known in the male sex by the exceedingly long attenuated abdomen, the brown color and form of the appendages. *L. vigilax* is a large slender metallic green species, the male of which has inferior appendages very straight and slender. The superiors are less curved than in our other species, and have but a single basal tooth.

Genus ARGIA, Rambur.

Of the three species of Argia known from Ontario two are found at Ottawa. In these the spines of the tibiæ are about twice as long as the spaces between them. In the remaining genera they are always shorter than this, generally shorter than the spaces between them.

7. ARGIA PUTRIDA (Hagen), Selys.

Ottawa, 4 males, 5 females (Fletcher, Harrington, Taylor); July 21st, 1907, 1 male (Young); Meach Lake, July 21st, 1907, 1 male, 1 female (Gibson); Sand Hill, Rideau River, July 2nd, 1906 (Fletcher).

On account of its large size this species is not likely to be mistaken for any other member of our fauna, unless it be a Lestes, from which it differs in the characters given. The males are at once known from those of Lestes by the appendages, which are very short and not forcipate as in that genus.

A. putrida is at first a dull brown or clay-colored insect, but the old males are quite conspicuous on account of the bluish-white dust which covers most of the body.

Unlike our other Agrionidæ, which prefer quiet marshy haunts, *putrida* inhabits exposed rocky shores, piers, etc., often where there is considerable wave action. It is probably common about all the larger bodies of water in the Ottawa district.

8. ARGIA VIOLACEA (Hagen), Selys.

Ottawa, 3 males, 1 female (Taylor); Meach Lake, July 21st, 1907, 1 male, 1 female (Gibson); Hull, July 13th, 17th, 1907, 9 males, 3 females (Gibson, Létourneau).

Apparently a common species in the Ottawa district,

though elsewhere in Canada it is known only from Algonquin Park.

The violet color of the males distinguishes them from all our other Agrionidæ, and the species is further distinguished from *A. putrida* by the smaller size and shorter pterostigma, which surmounts but one cell, that of *putrida* covering $1\frac{1}{2}$ cells or more.

In habitat *violacea* resembles the species of *Lestes*, *Enallagma*, etc., rather than our other *Argias*, being found about the marshy borders of slow streams and lakes.

Genus CHROMAGRION, Needham.

9. CHROMAGRION CONDITUM (Hagen), Needham. Fig. F.

Ottawa, 2 males (Harrington); Hull, June 6th, 1903, 1 male (Harrington); July 17th, 1907, 1 male (Létourneau).

This pretty damselfly can be recognized by the form of the male appendages and the coloration. The thorax is light blue with more or less yellow on the sides and below, and has a broad irregular mid-dorsal black band, but no lateral bands. The abdomen is, for the most part, black, with interrupted blue basal rings, while segments 8 and 9 are almost entirely blue.

It is a somewhat longer and more slender insect than *Argia violacea* which it otherwise resembles in size. It does not appear to be very common, although sometimes numerous locally.

Genus NEHALENNIA, Selys.

10. NEHALENNIA IRENE (Hagen), Selys.

Ottawa, 1 male, 1 female (Fletcher); June 3rd, 1903, 1 female (Harrington).

A very small delicate metallic-green species, with a blue-tipped abdomen and narrow yellow or blue interrupted basal rings on segments 3-6. The only other species in our fauna with which it might be confused is *N. gracilis*, which we took last summer in sphagnum bogs at Go Home, Georgian Bay, Ont. The two species are extremely similar in appearance, but in *gracilis* the last two segments of the male are entirely blue; in *irene* there is some bronze-green on the sides. The third margin of the prothorax of the female is bilobed in *gracilis*, trilobed in *irene*.

N. irene is generally abundant where it occurs, but on account of its small size, green color and low flight, it is usually overlooked by the general collector.

11. AMPHIAGRION SAUCIUM (Burns), Selys.

Ottawa, June 20th, 1894, 3 males, 3 females (Fletcher).

The red colour of this little species serves to distinguish it at once from all other members of the Zygoptera in our fauna, except perhaps the orange female of *Ischnura verticalis*, from which it differs in the absence of the two round spots on the back of the head, the reduction of the black markings of the abdomen (Seg. 1-5 in the male entirely red), and the uniform colour of the dorsum of the thorax, which is dull black in the male, reddish-brown in the female (striped in *verticalis*).

This species occurs throughout the United States, and in Canada has been reported from Quebec, Ontario, and British Columbia.

Genus ENALLAGMA, Charpentier.

To this genus belong the familiar little black-banded blue species that are so abundant about ponds and streams throughout the summer. The males of most species are readily separated by the form of the abdominal appendages, but the females are often impossible to determine with certainty. Their coloration is usually very different from that of the male, greenish or reddish yellow being the prevailing ground color of our species.

Enallagma is separated from *Ischnura* by the following venational characters. (See Fig. A). In the former the nodal sector arises near the fifth postcubital in the front wings and near the fourth in the hind wings; in *Ischnura* it arises near the fourth postcubital in the front wings and near the third in the hind wings.

12. ENALLAGMA HAGENI (Walsh), Selys. Fig. G.

Ottawa, July 23rd, 1907, 1 male (Gibson).

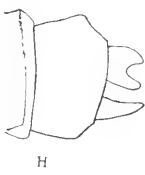
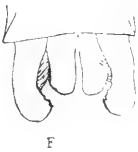
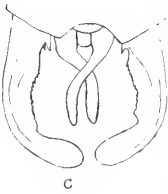
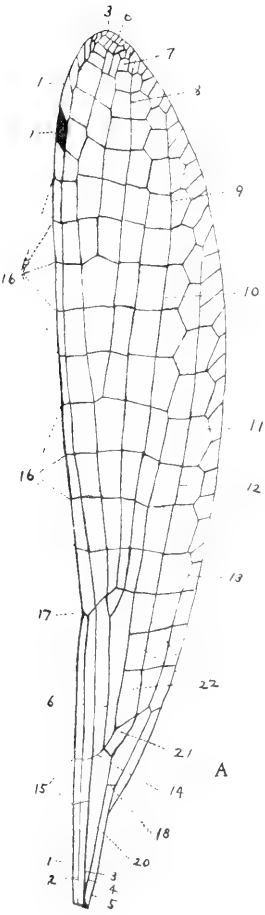
It is rather surprising to find but one specimen of this abundant species in the collection, although some of the females placed under *E. ebrium* may belong here. It is our most common and generally distributed Enallagma.

Apart from the differences in the abdominal appendages of the male, this insect approaches the next very closely.

13. ENALLAGMA EBRIUM Hagen. Fig. H.

Ottawa, 17 males, 19 females (some of the females may belong to *E. Hageni*); June 7th, 17th, 1899, 2 males; June 3rd, 1903, 1 female (Gibson); July 7th to 23rd, 1907, 7 males, 7 females; August 1st, 1907, 4 males, 1 female (Gibson, Létourneau); 3 males, 10 females (Fletcher, Taylor); Kettle Island, Ottawa R., July 2nd, 1906, 1 male (Gibson).

This is apparently the common Enallagma at Ottawa, and although an abundant species in many parts of Ontario, it seems to be more local than *E. Hageni*, and probably does not range so far north.



14. *ENALLAGMA EXSULANS* (Hagen), Selys. Fig. K.

Ottawa, July 28th, 1907, 1 male (Young).

A longer and more slender insect than the two preceding species, the males readily distinguished from these by the coloration as well as by the form of the abdominal appendages. In *E. Hageni* and *ebrium*, segment 2 is blue above with a black spot, that of *exsulans* entirely black. The abdomen in the first two is blue with black markings, in the latter, black with blue markings.

Several other species of *Enallagma* will probably appear about Ottawa. Of these the most likely to be found are *E. carunculatum* Morse, *Calverti* Morse, *pollutum* Hagen, and *E. signatum* Hagen.

(To be concluded in June issue)

EXPLANATION OF PLATE.

A. Hind wing of a member of the Zygoptera, *Enallagma Hageni*.

- | | |
|-----------------------|-----------------------------------|
| 1. Costa. | 12. Upper sector of the triangle. |
| 2. Subcosta. | 13. Lower sector of the triangle. |
| 3. Median vein. | 14. Arculus. |
| 4. Submedian vein. | 15. Antecubitals. |
| 5. Postcosta. | 16. Postcubitals. |
| 6. Principal sector. | 17. Nodus. |
| 7. Ultranodal sector. | 18. Basal postcostal vein. |
| 8. Nodal sector. | 19. Pterostigma. |
| 9. Subnodal sector. | 20. Basilar space. |
| 10. Median sector. | 21. Quadrilateral. |
| 11. Short sector. | 22. Antenodal cells. |

Dorsal view of the male abdominal appendages of:

- | | |
|---------------------------------|----------------------------------|
| B. <i>Lestes congener</i> . | E. <i>Lestes disjunctus</i> . |
| C. <i>Lestes unguiculatus</i> . | F. <i>Chromagrion conditum</i> . |
| D. <i>Lestes uncatus</i> . | |

Lateral view of the male abdominal appendages of:

- | | |
|------------------------------|--------------------------------|
| G. <i>Enallagma Hageni</i> . | K. <i>Enallagma exsulans</i> . |
| H. <i>Enallagma ebrium</i> . | |

BOTANICAL NOTES.

ANOGRA NUTTALLII (Sweet) A. Nels., Bot. Gaz. XXXIV: 368.

Oenothera albicaulis, Macoun, Cat. Can. Pl. I: 172 in part.

A common plant of the prairies from Manitoba almost to the foot-hills. *A. albicaulis* does not reach Canada.

ANOGRA PALLIDA (Lindl.) Britt.

Oenothera albicaulis, Macoun, Cat. Can. Pl. I: 172 in part.

Sandy plains near Lake Osoyoos, B.C., probably at or near the place it was collected by Douglas. No. 72,804 (J. M. Macoun). The plant collected by Hill near Spence's Bridge, B.C., and recorded by Prof. Macoun as *albicaulis* is likely this species. Specimens not seen. The specimens collected at Lake Osoyoos have the narrow leaves of *A. leptophylla* (Nutt.), but as Douglas collected around Lake Osoyoos these plants may safely be referred to *A. pallida*.

EPILOBIUM WYOMINGENSE, A. Nels., Bot. Gaz. XXX, 194.

The chief characters by which Mr. Nelson has separated this species from *E. palustre* are its longer smooth leaves and smooth stems and its smooth almost beakless seed. The only specimens in our herbarium that can certainly be referred here are No. 12,676 from Prince Albert, Sask. (*John Macoun*) and No. 72,371 from Little Lake Manitou, Sask. (*Macoun and Herriot*).

ERIGERON YELLOWSTONENSIS, A. Nels., Bot. Gaz. XXX: 198.

E. acris, L. var. *Dröbachensis*, Macoun, Cat. Can. Pl. I: 547 in part.

Easily separated from *E. Dröbachensis*, as it is known in Canada, by the hirsute, generally densely hirsute, involucre bracts. Our Rocky Mountain specimens are from Lake Louise, No. 65,544, Laggan, No. 65,545 and 65,546, Crow Nest Pass, No. 70,354 (*John Macoun*). Near Banff, No. 22,162 (*N. B. Sanson*). Maligne River near head of Athabasca River, No. 19,692 (*W. Spreadborough*). West of the Rockies it has been collected near Cascade, Kettle River, B.C., by J. M. Macoun, No. 65,033.

ALOPECURUS OCCIDENTALIS, Scribn. and Tweedy.

The only Canadian record is the one made by Prof. Macoun, Cat. Can. Plants, vol. II, p. 189. It has since been collected by Prof. Macoun at Milk River Ridge, Alta., No. 13,010, and Bragg's Creek, Elbow River, Rocky Mountains, No. 18,626.

J. M. M.

NOTES ON SILURIAN STROMATOPOROIDS FROM
HUDSON'S BAY.BY WILLIAM A. PARKS, PH.D., ASSOCIATE PROFESSOR OF
GEOLOGY, UNIVERSITY OF TORONTO.

Through the kindness of Dr. J. F. Whiteaves, the writer has had the opportunity of examining a collection of Stromatopora obtained by Dr. Robert Bell, Dr. A. P. Low, and by Messrs. Wilson, Dowling and O'Sullivan in the Silurian area to the westward of James Bay. The exact locality of each specimen will be found under the different species, but in general, it may be stated that the material was procured on the following streams: Pagwachuan River, Equan River, Little Current River, Attawapiskat River, and the Fawn Branch of the Severn, also on Cormorant Lake. None of the material can be said to be in a satisfactory condition, as the minute structure is, to a great extent, destroyed by interstitial crystallization. Silicification, so common in the Niagara horizon to the south of the Height of Land, has played but small part in the fossilization of these forms. The horizon indicated by the species found is, for the most part, comparable with the upper beds of the Niagara, but the extreme north of the region presents one species which occurs only in the lower Niagara and in the Clinton of southern Ontario. In association with some of the Stromatopora, Dr. Whiteaves finds *Pycnostylus guelphensis* and *P. elegans*, typical Guelph corals; but no Stromatopora exclusively Guelph has been identified. With the exception of two new species, a preliminary description of which is here given, all the forms are reviewed in an article now in press (Niagara Stromatopora, University of Toronto Studies, Geological Series, No. 5.)

CLATHRODICTYON VESICULOSUM, *Nich. and Murie*.

This wide-spread and varied species is the commonest form in the lower beds of the Niagara and in the Clinton of southern Ontario and the United States, but only one example has been identified from the present collection. This species is characterized by very close-set laminae from which the radial pillars arise by minute inflections. The varying manner of this inflection results in different degrees of crumpling of the laminae so that many varieties might be established, ranging from those in which the laminae are practically straight and the pillars independent, to those in which excessive crumpling has reduced the interlaminar spaces to a series of vesicles, and rendered the identification of the pillars as independent structures almost impossible. To this latter type the specimen under review

belongs. It is the occurrence of this example towards the north of the region that induces the belief that the geological horizon is there lower than farther to the southward.

Locality.—Limestone Rapids, Fawn Branch, Severn River, A. P. Low, 1886.

Another specimen presents an epitheca comparable with that of *C. vesiculosum* and also shows a faint evidence of the typical structure. Its identification is, however very questionable.

Locality.—Little Current River, 37 miles from mouth, W. J. Wilson, July, 1903.

CLATHRODICTYON DRUMMONDENSE, *Parks*.

This species occurs on Drummond and Manitoulin Islands and at Louisville, Ky. A full description may be found in the above-mentioned University of Toronto Study. Briefly it is characterized by a coarser structure than *C. vesiculosum*, and like that species it is capable of considerable variation in the crumpling of its laminae. The present example differs from the type in a more marked crumpling and consequent irregularity, and in the fact that this appearance is presented in bands corresponding, no doubt, to seasons of growth. If the laminae of this species are bent into "chevron-like folds" it passes into *C. fastigiatum* and there is no doubt that a close relationship exists between the two.

Locality.—Rainy Island, Attawapiskat River, Robert Bell, 1886. (See Pal. Fos. Vol. 111, Pt. IV, p. 244).

CLATHRODICTYON FASTIGIATUM, *Nich*.

A fragment, in all probability referable to this species, is found in association with *Actinostroma tenuiflatum* and *Stromatopora carteri*. The minute structure is largely indeterminate, but the vesicular character of the interspaces and the folding of the laminae are faintly perceptible.

Locality.—Station 641, Pagwachuan River, W. J. Wilson, July, 1904.

CLATHRODICTYON VARIOLARE, *von Rosen*.

A very small fragment is referred to this species. As its vertical extent is only a couple of millimetres, it is manifestly impossible to see the rows of large vesicles which alone distinguish the species from *C. vesiculosum*. It is, however, possible to make out the character of the fibre, and this, taken in connection with the mammillated surface, renders the above identification highly probable.

Locality.—Equan River, D. B. Dowling.

ACTINOSTROMA TENUIFILATUM, *Parks.*

For description see University of Toronto Studies, *op. cit.* Briefly, the species is characterized by continuous radial pillars and straight laminae, so spaced that about seven of each occur in the space of one mm. Vertical sections therefore present the appearance of a square network. While approaching the structure of the type specimen, the examples under review present some differences as follows: The laminae are not evenly spaced, but show more closely crowded bands alternating with wider spaced portions. There is also evidence of upward inflections in the laminae—a feature which is characteristic of the species next to be described. It would appear therefore that the present examples are intermediate between typical *A. tenuifilatum* and typical *A. inflectum*.

Localities.—Station 641, Pagwachuan River, W. J. Wilson, July, 1904; Pagwachuan River near mouth, W. J. Wilson, July, 1904.

ACTINOSTROMA INFLECTUM, *sp. nov.*

Judging from the number of specimens, this species is by far the most prolific in the region. While fragments only are available the inference is obvious that the coenosteum is of hemispherical shape, and that it reaches considerable dimensions. Vertical sections show it to be composed of delicate horizontal elements, the spacing of which is extremely variable—as many as ten or as few as three laminae occurring in the space of one mm. The concentric layers are connected by continuous radial pillars which occur to the number of six or seven in a mm. Instead of maintaining a horizontal direction, the laminae are bent sharply upwards at intervals of about one mm. As each overlying lamina follows the same course, and as the identity of the lamina is lost at the apex of the fold, the coenosteum appears to be traversed by vertical columns made up of loose vesicular tissue. These columns do not show the compact structure of those of Nicholson's *Stylodictyon*, but the general appearance of vertical sections is very suggestive of that genus. A similar arrangement is not uncommon in different Stromatoporoids, and it is very questionable whether it is a feature of generic value. These inflected portions doubtless represent astrorhizal systems, but horizontal canals are not perceptible. Owing to the upturnings of the laminae it is difficult to prepare sections which follow the course of the pillars over any considerable extent, in consequence one may easily mistake this species for a *Clathrodiction*.

Tangential sections do not reveal any astrorhizal canals, nor is the preservation sufficiently good to reveal the whorls

of connecting arms typical of the genus. Nothing is presented by such sections beyond the cut ends of the pillars, and the obliquely severed upturned edges of the laminae. Typical examples are easily distinguished from *A. tenuifilatum*, but intermediate forms connect the two species, so that one is tempted to regard the examples under discussion as representing a variety only of the latter species.

Localities.—Pagwachuan River, Station 641, W. J. Wilson, July, 1904; Pagwachuan River near mouth, W. J. Wilson, July, 1904; Little Current River, 17 miles from mouth, July, 1903.

STROMATOPORA CONSTELLATA, *Hall*.

The specimens listed below appear to be identical with *S. hudsonica*, Dawson. In the writer's opinion this species is indistinguishable from Hall's type, and therefore his name should have precedence.

Localities.—Equan River, D. B. Dowling; Little Current River, Station 67, W. J. Wilson, July, 1903.

STROMATOPORA CARTERI, *Nich*.

In his description of this species Nicholson states that he identifies one specimen from a boulder on Hayes River. There can be little doubt that the present example is also referable to the same species. The coenosteum shows the same irregular shape, astrorhizae are feeble or wanting, and the character of the reticulation is the same. The only difference is that the horizontal elements show more persistency than Nicholson's figures suggest. The specimen is not well enough preserved to reveal the tabulae of the zooidal tubes.

Locality.—Pagwachuan River, Station 641, W. J. Wilson, July, 1904.

STROMATOPORA WILSONI, *sp. nov.*

This species is founded on a poorly preserved specimen, but one which presents features rendering it impossible to ascribe it to any known species. The coenosteum is irregular and botryoidal in its manner of growth, and the surface is without mamelons. Astrorhizal systems are poorly developed and do not seem to be superimposed. The skeletal fibre is minutely fibrous, and the character of the reticulation like that of *S. carteri* but much finer.

Vertical sections show both pillars and laminae to be fairly persistent, but absolutely fused after the manner of true *Stromatopora*. About four laminae and five or six pillars occur in the space of one mm. The specimen is too badly preserved to show the tabulae of the zooidal tubes.

Tangential sections show numerous round holes—the cross sections of the zooidal pores. These are about one-fourteenth of a mm. in diameter, and are separated by somewhat greater intervals. Occasionally the pores are placed in communication with one another, so as to form horse-shoe shaped loops, and although astrorhizal canals can be observed, they are very inconspicuous. Owing to the curvature of the laminae a concentric arrangement is exhibited by transverse sections.

Stromatopora wilsoni resembles *S. carteri* in its manner of growth and in its feebly developed astrorhizal systems, and differs from that species in its finer grain and in the greater persistence of its horizontal elements. From *S. constellata* it is distinguished by its botryoidal manner of growth, the character of the surface, and the feeble astrorhizae.

Locality.—Pagwachuan River near mouth, W. J. Wilson, July, 1904.

STROMATOPORA, *cj.* INDIANENSIS, *Parks.*

A minute example of a coarse type of true *Stromatopora* is possibly referable to this species.

Locality.—Little Current River, Station 67, W. J. Wilson, July, 1903.

STROMATOPORA, *sp. indet.*

Encrusting on specimens of *Pycnostylus*, forming "potato-like masses" about 6 cm. by 4 cm. Surface smooth. Structure very fine and compact but too much altered to warrant description. Appears to be closer to *S. antiqua*, Nich., than to any other species.

Localities.—Nagagami River, Station 107, W. J. Wilson, June, 1903; Drowning River, 36½ miles from mouth, O. O'Sullivan, August, 1903.

Besides the above the collection contains specimens from the Drowning River, from the Nagagami River and from Cormorant Lake, in all of which the fibre is destroyed entirely beyond identification.

BIRD NOTES FROM GALT, ONT.

The most striking thing about our bird life since the beginning of the year has been its extreme scarcity. I have no remembrance of such a small variety of birds wintering with us, as has been the case this winter, and I have been through the woods and swamps a great deal snowshoeing. From January 1st to March 7th I never saw a single crow, the first time I can remember their entire absence, but jays were very plentiful. Outside of our regular winter residents, such as chickadees,

woodpeckers, tree sparrows, etc., little or nothing was to be seen. Even the brown creepers were very scarce. None whatever of our irregular winter visitants from the North arrived, such as snowflakes, pine grosbeaks and redpolls, while on the other hand, none of our irregular winter residents, such as goldfinches and pine siskins stayed, although early in January a few bands of cedar waxwings and golden-crowned kinglets were noticed. The migrations from the south so far this spring have been very irregular. As a rule robins, bronzed grackles and song sparrows arrive about the 15th to 20th of March, followed a few days later by bluebirds. The first indications of the spring movement were large bands of crows arriving on March 7th, the first I had seen this year. On March 12th robins arrived in some numbers, and I saw and heard one bronzed grackle, but not having seen any since think it must have travelled here with the robins. On March 14th a flock of three kildeer were sporting along the Grand River, which is very early for this bird. Tree sparrows are now giving song, but song sparrows and bluebirds have not arrived to my knowledge. To-day I saw a fine specimen of the great horned owl. We have still a depth of 20 inches of snow in the sheltered level woods as measured in many places to-day.

Galt, Ont., March 22nd, 1908.

W. HERRIOT.

COUNCIL MEETINGS.

A meeting of the Council was held on February 25th in the Normal School. Members present: the President, Mr. W. J. Wilson, Messrs. A. E. Attwood, A. Halkett, A. Gibson, E. E. Lemieux, H. H. Pitts, and T. E. Clarke; Rev. G. Eifrig, Miss A. L. Matthews, and Miss I. Ritchie.

Two ordinary members were elected, Mr. E. P. Venables, of Vernon, B.C., and Mr. F. W. Jacombe, M.A., M.F., Ottawa.

The Secretary presented a letter from the newly-formed Natural History Society of Edmonton, asking for any suggestions the Ottawa Field-Naturalists' Club might be able to offer to a new organization. This led Mr. Eifrig to suggest that we, ourselves, might with profit make a distinction between members of the Club and subscribers to THE OTTAWA NATURALIST. Several arguments were advanced for and against this plan, but no action was taken.

The Treasurer was instructed to notify delinquent members that names of those in arrears for more than two years would be struck off the lists.

Mr. Halkett was appointed to write a descriptive article on The Ottawa Field-Naturalists' Club for publication in the Saturday edition of one of the local papers.

The last Council meeting for the Club year 1907-08 was held on March 10th in the Normal School. The members in attend-

ance were, the President, Mr. W. J. Wilson, Rev. Mr. Eifrig, Messrs. A. E. Attwood, A. Halkett, J. W. Baldwin, A. Gibson, E. E. Lemieux, and T. E. Clarke, and Miss I. Ritchie.

The following ordinary members were elected:

Mr. J. S. Campbell, Magog, Que.

Mr. Jno. Murphy, 174 McLaren St., Ottawa.

Miss K. E. Bennett, Dufferin St., Ottawa South.

It was decided to recommend that the Publishing Committee should take steps towards having some complete sets of the Nature Study articles bound.

The President reported objections urged by Principal White of the Normal School, against the continued use of the store-room for library purposes. He also reported that the Library Committee had prepared a label for the bound volumes in the Carnegie Library, and that everything was in readiness for the work of cataloguing these.

EXCURSIONS.

The Excursion Committee has drawn up a programme which includes the names of a number of localities not visited by the Club in recent years. For rainy Saturdays, the Committee proposes meeting in turn at the Fisheries Museum, the Seed Division in the Canadian Building, and the Geological Survey. If the weather outlook for the afternoon is uncertain, it is proposed to visit the Experimental Farm instead of the locality named in the programme. If it is deemed advisable to cancel a regular excursion, notice of the change will be given at noon of the Saturday in question on the bulletin boards of the city newspapers. Members can get such information by telephone from Mr. A. E. Attwood, the President of the Club, or Rev. Mr. Eifrig, Chairman of the Excursion Committee, or Mr. A. McNeil, Phone 294, Canadian Building.

PROGRAMME.

April 25th, Rockcliffe Park.

May 2nd, Beechwood.

May 9th, Queen's Park, Aylmer.

May 16th, Beaver Meadow.

May 23rd, Ironsides and Wright's Island.

May 30th, Cumberland (General Excursion).

June 6th, Brennan's Wharf or Leamy's Lake.

June 13th, Cache Bay, Hull.

June 20th, Blackburn or McKay's Lake and Outlet.

June 27th, Eastman's Springs (General Excursion).

The time of meeting for sub-excursions has been changed from 3 o'clock to 2.30. Detailed notices of arrangements for each excursion will be given each Thursday in all the city papers

THE SPRING OF 1908.

One of the best means of fixing a date for the "Opening of Spring" is the flowering of trees and shrubs. The arrival of birds and the blooming of the Hepatica and the trailing arbutus are often used for this purpose, but the birds come and go and the depth of snow in the woods has a material effect on the date at which flowers bloom. Trees, however, bloom as soon as there is sufficient heat to cause the buds to open. Mr. W. J. Wilson has recorded the date of the flowering of *Acer dasycarpum* since 1895, and his records show that in only one year—1904—was this at a later date than in 1908. His records are: 1895, April 18th; 1896, April 16th; 1897, April 8th; 1898, April 2nd; 1899, April 20th; 1900, April 15th; 1901, April 15th; 1902, March 27th; 1903, March 31st; 1904, April 24th; 1905, April 12th; 1906, April 15th; 1907, April 22nd; 1908, April 20th.

J. M. M.

DESTRUCTION OF WOLVES.

Circular No. 63, issued by the Bureau of the Biological Survey, Washington, D.C., gives the results obtained during 1907, in the way of wolf destruction. The methods of capturing wolves in common use are three: (1) Trapping, (2) use of scents and (3) poisoning. For trapping, the best No. 4 double-spring trap should be used with a heavy stone as a drag. When possible the trap should be placed between two tufts of grass or weeds so that it can be readily approached from one side only. The trap, stone and chain should be buried on a runway. Scent is used to attract wolves to the vicinity of the trap. Fetid bait is made by placing half a pound of raw beef or venison in a wide-mouthed bottle, and letting it stand in a warm place for from two to six weeks. When completely decomposed, add a quart of any animal oil, an ounce of pulverized asafetida and an ounce of Siberian or Tonquin musk. The mixture should be sprinkled over the grass, weeds and ground near the trap, but never on the trap. No poison is so effective as sulphate of strychnine; 4 grains should be placed in a capsule and inserted in a piece of beef suet the size of a walnut.

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SOME SANITARY CONSIDERATIONS REGARDING THE CONSTRUCTION, HEALTH AND VENTILATION OF HOUSES*

By Peter H. Bryce, M.A., M.D., L.R.C.P.S, Editor,
Chief Medical Officer Dept. Interior.

Last year I had the pleasure of addressing the Club on the subject of climate in relation to health, and have thought it may be of interest and perhaps profit to speak to-night on the subject of House Atmospheres or Artificial Climates.

The value of fresh air and sunlight and the evils of foul air were then set forth, while I pointed out that these evils consisted always in the excess of carbonic acid, of lessened oxygen and deficient humidity in the house atmosphere in winter. It will be plain that the location of the house, as regards the nature of the soil, the free exposure to sunlight and air currents must be of much importance as regards health; but as it is not always possible to select the best location in the streets of a city, it is some comfort to remember that so long as the house can have the wind blow freely around it, there can be at least an assurance that ample fresh air can be had if we choose to allow it to enter the house. Let us then deal briefly with the nature of the soil under the house. Ordinarily in this country, no difficulty will arise with regard to the presence of decaying organic matter under the house unless in some old filled up ravine in a city. The upper organic mold is taken off when the cellar is excavated, and the chief difficulty experienced is to get rid of ground water when the house is on a clay sub-soil. Of course, in the city, an ordinary residence need not be more than 3 or 4 feet below the ground level, but with roof water and ground water running down the walls, provision must be made for its rapid removal to prevent a damp cellar, promoting organic decay as seen in moulds on the walls, on fruits,

*Address delivered before the Club, Jan. 7th, 1908.

etc. This can readily be effected by putting field tiles around the outside of the house wall 6 inches below the cellar level, and having them connected with the glazed tiles which will then carry away the ground water to the sewer. This is much more important and successful than attempting to keep out the water by laying cement floors and covering the walls on the outside with cement and wood tar, although both these are of supplementary value. How much difference there is in soils may be seen in the fact that different sands hold by capillary attraction from 15 to 25 parts in 100 of water, loam some 40 parts and clay 75 parts.

It is, however, most desirable that besides this drainage, we have a non-conducting wall, since the moisture of a cellar is often due to the wall of stone or cement being a good conductor and so, by stealing away heat, condensing the moisture on the cellar walls. This can be overcome by a wall with hollow spaces, gotten either by using hollow blocks or making a two-inch air space between the plaster and the wall, and providing by windows or other method for circulation of air.

Having arrived above the ground level, locality, as regards the price of stone, cement, brick, wood, etc., will assist in determining of what materials the house will be built. As regards warmth and dryness, it may be said, speaking generally, that the thicker the walls the stronger and warmer the house; but to even a greater degree warmth depends upon the nature of the materials used and the mode of construction.

To illustrate, it may be said that a wall made of silver a foot thick would be nearly ten times colder than one built of iron, as its conductivity is 1,000 to 125, while one built of stone is 100 times colder than one foot of air hermetically sealed between two boards, and glass 50 times colder, and brick 25 times colder than confined air of the same thickness.

It will be seen that this fact depends upon the relative conductivity of different materials, and of all the best non-conductor is a dry gas. We have to-day in a cement hollow wall combined much more nearly than in any other material, the elements of strength, warmth and cheapness, since while air spaces can be had with wooden and brick walls, the former will not remain close owing to its drying and warping, while a thoroughly good grouted brick wall with a really good air space will be notably more costly than cement.

The æsthetic question must be decided in conjunction with these several other elements. Having, however, gotten the kind of walls settled upon we have something to determine regarding the lighting of the house. The long side of the house ought,

if possible, to be to the south. The direct rays of sunlight are so active in promoting rapid metabolism in tissues, as observable in a plant placed in a south window, as compared with a north window, that nothing more need be said to illustrate the fact. Hence, we should get in all the sunlight possible.

As regards lighting, the amount of light required is large not only for sanitary purposes, but also for lighting up all parts of a room. One daily sees a householder either wishing, himself, or yielding to the desire of an architect to produce a so-called æsthetic effect by small, low, mullioned and small diamond-shaped panes in windows. It is absolutely wrong and only excusable if at all in a church, not in living or working rooms. A good rule is that the amount of the area of windows, placed as near the ceiling as possible, should be at least 1-5 of the floor area of a room, and direct sunlight ought to reach the farthest side of a room. Modern science, however has done something to increase the diffusion of light by ribbed glass and luxfer prisms.

Having now got our house built as a protection against cold and well lighted, we turn to the interior and enquire how we are going to maintain its air in such a condition of normal purity, moisture and temperature as will conduce to the highest degree of health in the inmates. I assume, of course, that the house has up-to-date plumbing and water supply. Now, as stated in my lecture last year, the problem is how to maintain the air in such a state that the carbonic acid will not be more than 5 in 10,000 parts, also to see that the relative humidity is about 70% and that the temperature is 60° to 65° F. It seems simple, but in a practice it is found to be even in a small house a relatively complex problem. First, as regards the temperature, this manifestly depends upon the kind of heating apparatus. We have practically two kinds for everyday houses, viz., hot air furnaces, and hot water pipes, and both depend for their success upon their ability to transmit to the air of different rooms an adequate amount of heat economically. Almost all know that to conduct warm air to the side of the house against which a strong wind is blowing is very difficult, if other pipes are present to lead the warm air elsewhere. On the other hand, hot-water pipes will carry heat in an amount directly in proportion to the extent of pipes in a room. It is further true that a well-constructed hot-water furnace will transmit into the flow of water through it, more heat units than could be transmitted to the air surrounding a hot-air furnace.

But apart from these two economic advantages to set against the greater one of the first cost of the hot-water system, there are several other very important items as regards the effect of

heat on persons in the room. Let us note the difference! It will not have occurred to many of us to enquire just how it is that we are warmed by heat, and more will be surprised when I say we are ordinarily not warmed by a furnace, *but are only kept from getting cold or chilled*. How, I am asked? We shall see. As all know, our bodies in health are maintained at a temperature of 98.4 F., some 30 degrees higher than the ordinary air of the room, so that clearly the air of the room cools us by abstracting heat from us, rather than by warming us. But we know that we have no sensation of cold and are warm, which simply means that we have not lost our body heat to the air of the room, so fast as to give us a sensation of cold. This is due to the non-conducting clothing which we wear and to the enveloping air being not too heated or too cold.

It is, however, quite manifest that what *too hot* or *too cold* means depends directly, other things being equal, upon the amount of fuel and upon the free circulation of the results of vital combustion in the human organism. The old person, the anæmic person, the person with poor circulation will be cold when the healthy are warm and so such must put more clothing on. But, moreover, there are in the air of the room say at from 60° to 70° F. some other differences depending upon the kind of indoor heating so great as to create very material differences in the effect of air at different temperatures upon the same person. I would recall to you the three ways by which all bodies lose their heat: (a) by radiation, (b) by conduction, (c) by evaporation. If we sit in front of a grate fire the air between the fire and us may be no higher than 70° F., but the side of our face towards the fire may actually be over 100° F. This is due to radiation, and means that heat waves penetrate into the tissues and warm the body, penetrating indeed deeper than the skin as well as into the walls opposite the fire. The same result, but less apparent, is obtained by the radiation from hot-water pipes, while in addition these warm the air in contact with them and this, ascending, again warms the particles of air it comes in contact with by convection. Now it will be apparent that if air comes into a room from a hot-air furnace, it in no way fulfils the first principle of heating by radiation; hence, it is found by experience that the air of a room at 60° F. receiving radiant heat from a radiator often gives a sensation of comfort as great as hot-air at 70° to 75°. There is, however, another equally important cause affecting the loss of body heat, viz., degree of moisture in a room or its *relative humidity*. You will remember I spoke of the fact last year that air at 0° F. holds less than 1 grain of water vapour and that with every 20 degrees increase, say, to 70°, such increase of its

capacity takes place that it then will hold actually 7.9 grains, or eight times as much. Now we have already referred to moist air being four times a better conductor of body heat than dry air is; hence, while outer air at zero heated and brought into a room at 80° F. is made much drier and enveloping our bodies acts as a non-conductor of body heat, yet it actually serves to rob the body of its heat by its causing evaporation through insensible perspiration from the surface at so rapid a rate as to actually produce a sensation of cold. Indeed, experimentally we know that a room at 60° F., with a relative humidity of 70% approaches the happy medium of comfort and with no air currents occurring in the room lends to persons sitting still a sensation of *bien être* perhaps greater than any other temperature. It is further most important, from the standpoint of economy, since it is found especially in cold weather, that just as radiation is proportionately rapid in proportion to the difference in temperature between two bodies, so every extra degree of increased temperature required of a furnace means notably more coal consumed. Indeed, as much as 25% more coal it is estimated is required to maintain 70° F., instead of 60° F. in say zero weather.

It is, however, important to remember that into this heating problem other most important factors enter. Thus a single window radiates heat probably 25 times as fast as would double windows with tight space of air say 6 inches in thickness. Hence, a double window is a *sine qua non* to effective heating and ventilation in a cold climate. But more than this, a great difference is found in the radiation of heat between the north and south sides of a house, in cold weather. In the cold weather during the day the sun streams in the south windows by radiant heat warming all the walls as well as the air of the rooms. The north side is never so warm; but on the contrary, is exposed to the northerly winds which are found to rob surfaces of heat directly in proportion, not alone to their temperature, but also to their velocity. We thus have illustrated how many factors enter into the heating of even a small house. But we have said nothing of how in keeping the house warm we may also maintain its air fresh. One thing is quite clear, viz., if we exhale some 2 lbs. of carbonic acid in 24 hours, due to inhalation of oxygen (3 lbs.) and to tissue combustion that placed in a box sealed hermetically we would gradually exhaust all the oxygen or be poisoned by the carbonic acid and other volatile emanations from the body. Clearly we require to introduce fresh air and its oxygen, estimated to be at the required rate of 2,000 cubic feet of fresh air per person per hour. Naturally, when we do this, we must push out the foul air and so it comes about that we must by some simple

mechanical means introduce into the well-built closed room a steady current of fresh air in such a manner as will effect the required result. If, at the same time, we have supplied this outdoor air with adequate moisture on its ingress, we shall have fulfilled every condition provided only that we so deliver the air that it shall not create a draught. Various mechanical details may be adopted to accomplish this end, varying in accordance with the construction of a house, the amount of exposed surface, and so on; but if we have fully grasped the conditions required, it will not be difficult for one who has thoroughly grasped the needs to find some person of experience who will indicate the method of dealing with any particular situation.

COUNCIL MEETING.

A meeting of the Council was held on April 29th in the Carnegie Library. The members present were: The President, Mr. A. E. Attwood, Rev. C. G. Eifrig, Miss Q. Jackson, Messrs. A. Halkett, A. Gibson, C. H. Young, J. M. Macoun, L. H. Newman and T. E. Clarke.

The following were elected ordinary members: Mr. T. E. Perney, B.A., Mr. F. C. Poole, Miss L. M. Ross and Miss A. Johnstone.

The President was appointed the Club's delegate to the meeting of the Royal Society of Canada.

The President reported having made arrangements to secure 500 copies of the Evening Journal containing the special article on The Ottawa Field-Naturalists' Club. It was decided that members of the Council be given what copies they might require to be used in a canvass for membership, and that the remainder be placed in charge of the Librarian, Mr. Young, from whom members of the Club could obtain copies.

REPORT OF THE ENTOMOLOGICAL BRANCH,

1907

(Read before the Club, January 21st, 1908).

The Leaders of the Entomological Branch have again pleasure in reporting that many of its members have been actively engaged during 1907 and that much useful work has been done, even although the season, from an entomological standpoint, was a very poor one. In the Ottawa district, the local members have assiduously continued their studies and many new records have been made of insects not hitherto found in the vicinity. Special attention has been devoted to the moths and butterflies, dragonflies, bees and the true bugs, as well as to the spiders. The beetles and flies have also been worked to a less extent. Large collections of Ottawa dragonflies have been made and these are being worked into a paper for *The Ottawa Naturalist* by Dr. E. M. Walker, of Toronto, with the special object of encouraging and helping our local collectors to devote more study to these important insects.

The fortnightly meetings of the Branch were continued in 1907, and these gatherings proved, as in the past, of much benefit and interest to those who attended them. Much valuable information is brought out in the discussions at these meetings which otherwise would be lost to the members.

During the past summer some of the members of the Branch had the pleasure of enjoying the visits to Ottawa of two distinguished entomologists from the United States. In June, Mr. W. D. Kearfott, of Montclair, N.J., the well-known specialist in microlepidoptera, who has identified so many local species, spent a week in Ottawa, and, with some of the members, made several expeditions to localities recognized as being within the area known as the Ottawa District. Special trips were made to Meach Lake and the Mer Bleue and hundreds of specimens of desirable material were collected. Mr. Kearfott is working up the species taken while here, and a paper treating of these will, we hope, soon be ready for publication. Almost following Mr. Kearfott's visit, Dr. Henry Skinner, of Philadelphia, one of the leading American authorities of diurnal lepidoptera, arrived in Ottawa for a short stay and met some of the members of the Branch.

During the year, six of the local members made special collections of insects at different points in Canada. Dr. Fletcher, with Dr. Skinner, travelled through Manitoba and the Northwest in July and August, and specimens in all orders were taken, at Nepigon, Ont., Aweme, Man. (the home of our

esteemed member, Mr. Norman Criddle), Rudy and Radisson, in Saskatchewan, and at Edmonton, Calgary, Banff and Laggan, in Alberta. While along the line of the Canadian Northern Railway they were accompanied by Mr. T. N. Willing, of Regina, an enthusiastic naturalist and member of the Club. Mr. Andrew Halkett, while making special collections of the fishes of the Northwest for the Alberta and Saskatchewan Governments, devoted some time to the collection of insects of the Beaver Lake and Qu'Appelle Lakes districts. Mr. Arthur Gibson spent the first three weeks of September at Rostrevor, Muskoka, and, although late in the season, fair collections of the insects of the immediate neighborhood were made and some records added to the Canadian list. Our President, Mr. W. J. Wilson, again visited the Hudson Bay Slope and, as in past years, notwithstanding the pressing nature of other duties, collected some insects in various orders which included several records of scientific interest. Mr. Joseph Keele, of the Geological Survey Department, who has again been exploring in the Yukon, along parts of the Stewart and Pelly Rivers, has sent back a few specimens of lepidoptera, every one of which is of scientific interest, as exact data are given with regard to the dates and localities. Mr. D. H. Nelles, of the Alaska Boundary Survey, made a small collection of beetles and butterflies at Bartlett Bay, off Glacier Bay, Alaska.

In May last our Honorary Member, the Rev. G. W. Taylor, while attending the meetings of the Royal Society of Canada, identified many geometrid moths for our local collectors and also attended the spring excursion of the Club to Beaver Meadow. Mr. Taylor, who is the leading North American authority on the Geometridæ, has published the descriptions of many species during the year, and has been a great help to Canadian students in identifying their material.

Mr. J. B. Wallis, one of the Winnipeg members, made large collections of coleoptera and lepidoptera at Banff, Alta., and Peachland, B.C. All of Mr. Wallis's collections have not, as yet, been worked over, but these are now being studied and lists will soon be prepared. Several very interesting captures were made at the above localities which have considerably extended the known distribution of some species.

Among the more interesting insects taken during the year at Ottawa, within the district as limited by the Club, the following may be mentioned:—

LEPIDOPTERA:—

Cinclidia harrisii, Scudd. Blackburn, June 28, July 5, (Young). First records for the district.

Pamphila palæmon, Pallas. (*Carterocephalus mandan*, Edw.) Eastman's Springs, June 19, several specimens (Gibson and Young). The only previous record for the district was of a single specimen taken in the same locality some years ago by Dr. Fletcher.

Ampelophaga versicolor, Harr. A perfect specimen of this rare hawk-moth was taken at the Power House on the Britannia Electric Car Line, on Aug. 18, (Baldwin).

Sphinx canadensis, Bdv., July 6, (Baldwin). A very rare species.

Apantesis virgo, L. var. *citrinaria*, N. & D. A fine specimen of this rare variety, which has yellow hind wings instead of red, was taken on Aug. 4 by Mr. Baldwin. This is the first record of the variety having been taken at Ottawa. In a paper on the Genus *Apantesis* in the CANADIAN ENTOMOLOGIST, May, 1903, the only Canadian record then known, was of two specimens which had been reared from larvæ at Hamilton, by the late Mr. J. A. Moffat.

Apatela radcliffei, Harvey. Mature larva found on apple, Sept. 26, (Létourneau). The species is rare at Ottawa.

Apatela funeralis, Grt. Bred from larva found on maple, June 10, (Young). Dr. Fletcher had previously reared the moth from a larva found on birch. Other food plants are hickory, elm and apple.

Apatela retardata, Wlk., June 16, (Fletcher). June 12, (Gibson).

Gortyna inmanis, Gn., Sept. 14, (Fletcher). This interesting species has not been found at Ottawa for some years.

Papaipema pterisii, Bird. In last year's Report this insect appeared under the name "*Papaipema harrisii*, var." but Mr. Bird has since decided that it is not a variety of *harrisii*, but a new species, and has described it under the above name. The larva has been found in the bases of the fronds of the Common Brake, (*Pteris aquilina*).

Hydriomena contractata, Pack. Ottawa, 10 Sept., (Fletcher). Only two or three specimens of this geometrid moth have been taken at Ottawa.

Phlyctænia acutella, Wlk. A specimen of this rare pyralid was taken by Mr. Young. Mr. Metcalfe took a specimen at Toronto some years ago.

Enarmonia americana, Wlsm. June 11, (Gibson). A handsome little species not taken here before.

Sparganothis flavibasana, Fern. The larvæ of this tortricid

were abundant in the arboretum of the Central Experimental Farm, on *Lonicera japonica*. Moths reared from larvæ emerged on July 2 to 6. The insect is rare in collections, and has never before been found at Ottawa.

Depressaria sabulella, Wlsm. In house, April 16, (Gibson). A new record for the district.

COLEOPTERA:—

The following are a few records of beetles taken:

Hydaticus stagnalis, Fab. In moss, (H. M. Ami). Mr. Harrington has only twice found the species at Ottawa.

Harmonia picta, Rand. On larch, Sept. 1, (Fletcher).

Ligyrys relictus, Say. One specimen at Meach Lake, (Fletcher). Rare at Ottawa, but found in considerable numbers by Mr. Gibson at Rostrevor, Ont.

Lixus concavus, Say. Three specimens found on *Polygonum pennsylvanicum*, (Young.) First Ottawa records.

Otidoccephalus chevrolatii, Horn. Meach Lake, Aug. 1; (Young).

Orchestes rufipes, Lec. This rare little weevil was very abundant and destructive to willows at Ottawa in September, the larvæ mining in the leaves, and the mature beetles eating out the surface in a similar way to flea-beetles. (Fletcher).

Merium proteus, Kirby. A specimen of this longicorn, which is very rare at Ottawa, was taken on June 28, by Mr. Ernest Guignard.

HYMENOPTERA:—

Pamphilus ruficeps, Hargtn. May 31, (Harrington).

Ichneumon milvus, Cress. Meach Lake, Sept. 1, (Fletcher). One of our rarest ichneumons.

Psithyrus laboriosus, Fab. April 26, (Fletcher).

Collections of Canadian Bombi have recently been kindly determined by Mr. H. J. Franklin, of Amherst, Mass., and among the species of local interest, the following are mentioned:—

Bombus impatiens, Cress. Oct. 2, (Fletcher).

Bombus pennsylvanicus, De G., (Fletcher).

Bombus perplexus, Cress. Meach Lake, July 20, (Gibson).

Bombus vagans, Sm. Aug. 25, May 5, (Fletcher).

HEMIPTERA:—

Mr. Metcalfe has continued his studies of these insects, and among those recently determined by Mr. Van Duzee, of Buffalo, the following are of special interest.

Ceresa constans, Wlk., Hull, very local, but abundant on three special basswood trees, Aug. 25, (Metcalf). A distinct and readily recognized species.

Pediopsis bifasciata, Van Duzee. Mer Bleue, on aspen poplar, June, a good species distinct from *trimaculata*, Fitch. (Metcalf).

Peltonotellus histrionicus, Stal. Mer Bleue, August; the rare macropterous form of this nearly always wingless species. (Metcalf).

Clastoptera proteus, Fitch. subsp. *nigra*, Ball. Mer Bleue, August. New to the Ottawa district. (Metcalf).

ODONATA:—

As mentioned above, large collections of Ottawa dragonflies were made during the past summer. Among these were many species worthy of mention, but as Dr. Walker is working up this material, along with other collections previously made at Ottawa, for a paper for the Ottawa Naturalist, it has been thought best not to publish these records here, as they will all be included in Dr. Walker's article soon to appear.

W. H. HARRINGTON,	} Leaders.
JAMES FLETCHER,	
ARTHUR GIBSON,	
C. H. YOUNG,	
J. W. BALDWIN,	

MEETING OF THE ENTOMOLOGICAL BRANCH

Held on evening of February 23rd, 1908, at Mr. Gibson's house. Present: Messrs. Harrington, Young, Fletcher, Baldwin, Halkett, Metcalfe, Letourneau and Gibson.

Mr. Halkett spoke of his work during the past summer in the Beaver Lake and Qu'Appelle Lakes districts of the Northwest. Large collections of fishes were made for the Governments of Alberta and Saskatchewan, and while engaged in this work, some interesting insects were collected from time to time. Mr. Halkett showed three bottles containing specimens in fluid, which he had collected. Most of these were aquatic insects in an immature state. Some large curious larvæ of a *Dytiscus* was noticed, which had been collected at the same time and place as the perfect insects of *Dytiscus circumcinctus*. Dr. Fletcher stated that some of Mr. Halkett's captures were of interest and

were being recorded in the Entomological Record for 1907, which will appear in the annual report of the Entomological Society of Ontario for that year.

Mr. Létourneau showed inflated specimens of the larvæ of *Apatela radcliffei* and *Apatela interrupta*, both of which he had collected on apple. Mr. Young said he had found the larva of the former at Ottawa on Mountain Ash. A general discussion followed on the food plants of lepidopterous insects, and many interesting points were brought out.

Mr. Baldwin exhibited a case containing some rare captures which he had made during the past summer. The most interesting were *Sphinx canadensis*, *Ampelophaga versicolor* (a beautiful specimen), and *Apantesis virgo*, var. *citrinaria*. All of these had been taken at light.

Mr. Metcalfe showed a long series of the interesting little homoptera belonging to the genus *Psylla*. He stated also that unfortunately many of these, although clearly distinct, had never been named. In the meantime he was saving all he collected and taking careful notes as to dates, localities and food plants. He also showed a nice collection of Manitoba hemiptera which had been sent to him by Mr. Criddle of Aweme.

Mr. Harrington showed some acorns of Red Oak which had been collected when newly fallen in the autumn of 1906 at Kirk's Ferry, Que. He had found a large percentage of the fallen acorns infested by the galls of some cynipid. These fusiform whitish galls arose from the base of the nut and developed between the nut and the cup, generally protruding slightly above the cup and causing a marked depression in the nut. The majority of the infested acorns had only one or two galls, but some had as many as five. These greatly exhausted or perhaps destroyed the vitality of the nuts. He had not succeeded in breeding the gall-maker or in finding any reference to such a gall.

Mr. Harrington also exhibited a recent fascicule of the *Genera Insectorum* containing a monograph of the Trigonaliidæ by Mr. W. A. Schulz. The forty-two known species of these interesting hymenoptera are divided into seventeen genera, and five sub-families are indicated. The distribution of the insects is world-wide, but they appear to be most abundant in Central and South America. Only one Canadian species is known which was collected in Vancouver Island by Rev. G. W. Taylor and was described by Mr. Harrington as *Trigonalis canadensis*. This species has been made by Schulz the type of a new genus *Bareogonalos* and with *B. Scubellaris* Cam. (Mex.) forms the sub-family *Bareogonaloïnæ*. A specimen of the male was shown and attention called to the armed scutellum and other generic characters.

Dr. Fletcher exhibited a pair of the very rare *Neophasia terlooii*, Behr, which had been given to him with many other rare species by Dr. W. Barnes, of Decatur, Ill. An account was given of a most enjoyable day spent with Dr. Barnes at his home, in company with Dr. J. B. Smith and Mr. H. H. Lyman. Among other specimens shown were: A grand specimen of the Tarantula, *Mygale hentzii*, Girard, which had been presented to the Division of Entomology by Mr. W. Bremner and was found in the building of the Ottawa Fruit Exchange. It had doubtless been imported with fruit from the south. This specimen measured over 6 inches from tip to tip of the outstretched legs, and the body was nearly 2 inches long. Some specimens of both sexes of the interesting little *Boreus californicus* which had been received in a living condition from Mr. J. W. Cockle, of Kaslo, B.C. A fine specimen of *Cyphoderris monstrosa*, Uhler, from Peachland, B.C., a new locality where it was discovered during the past summer by Mr. J. B. Wallis of Winnipeg. A pair of the very handsome Scarabæid beetle *Plusiotis gloriosa*, Lec., from Dr. Henry Skinner of Philadelphia, who had collected them himself in the Huachuca Mountains of Southern Arizona. Five specimens of *Pontia napi*, L. var. *b. hulda*, Edw. which were taken by Mr. Douglas H. Nelles, on the 10th of June last at Bartlett Bay, off Glacier Bay, Alaska. Male and female specimens of the Brown-tail Moth, which had been reared in the Entomological Division from young larvæ collected in Nova Scotia last spring. Dr. Fletcher also exhibited for comparison a specimen each of *Belostoma americanum* and *Benacus griseus*. He pointed out the difference in the front pair of raptorial legs, but was unable to see why it had been considered necessary to put these two insects into different genera.

Mr. Young showed two beautiful cases illustrating the life histories of *Samia cecropia* and *Tela popyphemus*, Cram. These artistic cases were much admired by all present.

Mr. Gibson showed a selection of species from a collection of insects of all kinds which he had made at Rostrevor, Ont., on Lake Rosseau, Muskoka, last September, and spoke on the rare or more interesting species taken. He mentioned that he was preparing a list of the species of lepidoptera collected.

A. G.

REPORT OF THE ORNITHOLOGICAL BRANCH, 1907-08.

The Ornithological Branch of the Ottawa Field Naturalists' Club met during the year 1907 at more or less irregular intervals. It has carried forward the work of rendering complete and up-to-date the local list of birds. Field work was carried on, especially so during the spring and migration months of last year. The spring migration of birds of 1907 was found here, as over practically the whole eastern half of North America, to have been very abnormal owing to the protracted cold weather of that spring. These variations in temperature, etc., render the migration of birds doubly interesting to the observer, as there are no two migrations quite alike. An account of the last spring migration was published in the "Ottawa Naturalist" in the May and August numbers. Other facts concerning the birds hereabouts have been published from time to time. An interesting specimen has lately come into the hands of one of our members, namely, a Great Horned Owl (*Bubo virginianus*) from Inlet, Labelle Co., Que. In plumage it is a much lighter one than those found here usually are, and it furthermore bore very palpable evidences of having, shortly before it was shot, engaged in a fight with a porcupine. It was liberally sprinkled over with quills, especially in the sole of the right foot, the quills having penetrated even that horny and hard skin, also under the right wing, on the breast, neck and even two in the left eye-lid. Some of the quills had penetrated the thick solid muscles of the breast, lying against the sternum. Fifty-six quills and parts of quills were extracted from the skin and flesh and about 10 more were left in. How did this owl come to tackle such an undesirable antagonist or prey? The probability is that the owl was foraging for food, and being very hungry—which is a common occurrence for them in winter—she swooped down on the first moving object that even remotely appeared like legitimate prey and in her eagerness, and possibly by reason of the darkness of the woods, did not find out her mistake until she had reached forward with one claw and gotten that full of spines and simultaneously receiving a slap from the tail of the porcupine that lodged the rest of the little barbed spears in her anatomy. Most of the hawks and owls which we receive here in winter have empty stomachs, showing that hunger must be a very frequent, if disagreeable experience with them. It also seems that at such times the gall discharges very copiously into the stomach, as the stomachs in such cases are always very green, as are also the intestines. Probably a way nature adopts to relieve the pain of hunger somewhat.

Now, a few recommendations. We would urge such as take

an active interest in birds and their study to send in their names and addresses to Mr. A. G. Kingston, 241 Nicholas St., so that our section would become larger and more efficient, and so that our meetings could be held with greater regularity, which is now precluded by the preoccupation of other duties on the part of its members.

Then, we would urge all members of the Field Naturalists' Club to look upon themselves as protectors of birds at all times and wherever they are. Let them hinder wanton destruction of bird life whenever a chance offers, and instill into others, especially children, a sympathetic interest in birds, which, in the end, is the best safeguard of birds.

At the same time other enemies of birds must be kept in check. According to systematic investigations of the Massachusetts Board of Agriculture, the domestic cat is one of the worst foes of birds. The cat should, therefore, be kept in the house, especially in the outlying portions of the city and on the farm, particularly at the nesting time, and if a cat is found to have acquired the habit of killing birds, the best remedy is to forever put the cat out of harm's way. In Germany some cities, having many parks, have during several years past employed regular cat-catchers, who manage to take in from 10 to 15,000 cats in one city. These are then so dealt with that they can no longer kill birds. A good precedent to follow.

Much can also be done in the way of protecting and increasing the numbers of birds by people having gardens, or farms, or at least a number of trees around their houses, by putting up nesting boxes. These should be made so as to be acceptable to wrens, bluebirds, swallows, etc. They should be made accessible to people, so that the nests of the house sparrow can from time to time be destroyed.

Let us do all we can to protect the birds, these useful and beautiful helpers of man in the economy of nature, and to increase their numbers.

The Ornithological Section,

G. EIFRIG,

A. G. KINGSTON.

EXCURSIONS.

Heavy rain made it necessary to cancel the first excursion of the season which was to have been to Rockliffe. The following Saturday, however, May 2nd, though the weather was threatening, a surprisingly large number of members and friends of the Club went to Beechwood. Owing to the lateness of the season, none but the very earliest of the Spring flowers were found, and for the same reason the insects seen were few in number. Mr. Eifrig, who led the ornithologists, recorded 21 species of birds and noted their numbers. They were: One brown creeper, about 50 bronzed grackles, 10 red-winged blackbirds, 5 chipping sparrows, 2 kingfishers, 5 crows, silent and breeding, 5 song sparrows, about 75 tree swallows, 2 meadow larks, 25 robins and one nest with 2 eggs, 2 bluebirds, 1 flicker, 5 juncos, 25 golden-crowned kinglets, 1 cowbird, 1 downy woodpecker, 1 bittern, 4 myrtle warblers, 1 purple finch, 3 bluejays and 2 white-throated sparrows. Under stones, bark and pieces of wood some beetles and hymenopterous insects were collected. The former were common ground beetles which may generally be collected in such places at this time of year. A large number of *Halisidota* were noted under stones and some millipedes and spiders were collected by the entomologists. A fine *Lycosa* was found by Mr. Letourneau. These stout, hairy spiders, popularly known as "running spiders", make conspicuous holes in the ground in which they live. Two specimens of a salamander (*Plethodon erythronotus cinereus*) were collected.

Those interested in geology examined the Utica shales along the road leading to Beechwood and in the woods north of the road, but no fossils were found. Keefer Bluff, at the entrance to Beechwood, was next examined and here a number of fossils were collected by different members of the party. These limestones are of the Black River formation which produces excellent stone for building purposes. The characteristic coral *Tetradium fibratum*, was found in abundance.

The succession here, if complete, would be in ascending order, Black River, Trenton and Utica, but the Utica is really lower than the Black River, though originally there were 600 feet or more of Trenton limestone between them. The present condition was brought about by a fault or break which has caused the Trenton and Utica to sink down about 700 feet.

About 5 o'clock the excursionists met at the entrance to Beechwood Cemetery where short talks were given by Messrs. Attwood, Halkett, Eifrig and Criddle.

J. M. M.

THE OTTAWA NATURALIST

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No. 2

THE DRAGONFLIES (ODONATA) OF THE OTTAWA DISTRICT.

BY E. M. WALKER, B.A., M.B., Toronto.

(Continued from April Number)

Since the first part of this paper appeared Dr. Fletcher has sent me another small collection of Odonata made at Ottawa some years ago by Mr. T. J. MacLaughlin. The specimens are largely destroyed by museum pests, but are, for the most part, determinable, and among them are three genera and six species, which I had not seen before from this region. These, together with a specimen of *Lestes rectangularis*, which was overlooked in preparing the first part of the paper, increase the list of Ottawa Dragonflies from 47 to 54 species.

I have also received from Dr. Fletcher a copy of Vols. I-II of the Transactions of the Ottawa Field Naturalists' Club, which contains a paper by Mr. MacLaughlin on Ottawa Dragonflies (Vol. II, 1887, pp. 329-342). The species mentioned in this paper were determined by the Abbé Provancher, but it contains some obvious errors, which may be noted here.

The description of *Calopteryx virginica*, Drury, evidently refers to the female of *C. aequabilis*. *C. virginica* is in fact a synonym of *C. aequabilis*.

Of *Lestes* two species are mentioned, *unguiculata* and *curina*. Two male *Lestes* in MacLaughlin's collection bearing these specific names respectively, both belong to *L. forcipatus*. A female of *L. uncatius* is the only other *Lestes* in the lot. His *Agrion Hageni* is evidently *Argia putrida*, while *Agrion putridum* refers to one of the smaller Agrionidae. *A. durum* and *civile* both now placed in *Enallagma* probably refer to other species of that genus, while *A. iners*, which is a synonym of *Ischnura Ramburii* is doubtless *I. verticalis*.

Genus *ISCHNURA*. Charpentier.

This genus is distinguished from *Enallagma* by the characters given under the latter.

Of the three species reported from eastern Canada, two are found at Ottawa.

15. *ISCHNURA POSITA* (Hagen), Needham.

Ottawa, 3 males, 3 females (pruinose) (Harrington, Taylor, Fletcher).

This little dragonfly may be known by its bronze-black color, and the interrupted antehumeral thoracic band, in the form of an !. The abdomen of the male is black with narrow yellow basal rings on most of the segments. The female is paler and the antehumeral stripe not always interrupted.

This is the first notice of its occurrence in Ontario, although it has been reported from Quebec and is common in many parts of the United States.

16. *ISCHNURA VERTICALIS* (Say), Selys.

Ottawa, 3 orange females (Harrington, Taylor); Mer Bleue, June 1st, 1903, 1 male (Gibson); Hull, July 13th, 1907, 1 male, 1 black female, 3 pruinose females (Gibson); July 17th, 1907, 1 pruinose female, 1 orange female (Létourneau).

A widely distributed and very common species, flying from spring until autumn.

The thorax of the male is yellowish-green, striped with black, the abdomen black with pale blue interrupted basal rings, and segments 8 and 9 azure blue with a black stripe on each side. A bifurcated process on the apical dorsal margin of segment 10, together with the venational characters given, will serve to distinguish it from certain species of *Enallagma*, which bear a slight resemblance to it in coloration.

The female appears in two color varieties, the 'black female,' colored like the male when young, and the 'orange female,' in which the ground color is reddish-orange banded with bronze-black. Both forms become pruinose when old, appearing then as though covered with a dull bluish dust. The orange female is the commoner form in the spring, the black in the summer. The latter seems to become pruinose very soon after maturity.

APPENDIX TO THE ZYGOPTERA.

17. *LESTES FORCIPATUS* Rambur.

2 males (MacLaughlin).

These are the first Canadian specimens I have seen, although it has been recorded from Grimsby, Ont., and various parts of British Columbia.

The characters by which it is separated from the closely allied *L. disjunctus* have been given under that species.

18. *LESTES RECTANGULARIS* Say. Fig. 2.

Ottawa, 1 female (Harrington).

This specimen, which is damaged, was included in *L. unguiculatus* in the first part of this paper.

General color metallic brown, the face and under parts pale yellow or greenish. The humeral stripe is rather broad and there are narrow interrupted yellow rings at the bases of most of the abdominal segments. The abdomen of the male is extremely attenuated.

Sub-order. ANISOPTERA.

Family. AESHNIDAE.

Antecubitals of first and second series not coincident (except the first and one other); inner end of the pterostigma supported by an oblique vein (Fig. 1).

There are three subfamilies, all of which are represented in the Ottawa collections. These are the Gomphinae, Cordulegasterinae and Aeshninae.

In the Gomphinae the eyes are widely separated and the abdomen is without lateral carinae, that of the male being more or less dilated apically. The coloration shews relatively little variation, being usually black or brown with yellow or green bands and spots. They are more local in distribution than most of our dragonflies, but are often exceedingly numerous where they occur.

The Cordulegasterinae much resemble the Gomphinae in appearance being black insects conspicuously spotted with yellow, but the eyes are larger and are separated above by a very narrow space or meet at a point. The abdomen is slightly or not at all dilated apically.

In the Aeshninae the eyes are larger and meet for some distance on the top of the head. Lateral carinae are present on the abdomen, which is not at all dilated posteriorly.

Sub-family GOMPHINAE.

Of the several genera represented in the eastern provinces, only one, *Gomphus*, with 4 species, has been met with at Ottawa. Other species of this genus as well as a few belonging to allied genera will be almost sure to reward the efforts of the industrious collector in this district, and among these may be mentioned the following: *Hagenius brevistylus* Selys, *Ophiogomphus rupinulensis* (Walsh), Hagen, *Dromogomphus spinosus* Selys, *Gomphus scudderi* Selys, *G. spicatus* Hagen and *G. sordidus* Hagen.

Genus GOMPHUS, Leach.

This large genus may be known from the allied genera mentioned by the following group of characters: Triangles without cross-veins, thorax green or yellow with conspicuous brown or black bands, hind femora with numerous small spines, but no large ones.

19. *GOMPHUS VASTUS* (Walsh). Fig. 3.

Hull, June 29th, 1886, 3 females (Fletcher).

Face transversely banded with black, dorsum of thorax with a pair of narrow equal divergent yellow bands, each forming below an acute angle with a shorter transverse band and uniting above with a narrow complete antehumeral band. Segments 7-9 remarkably dilated, especially in the male.

This species is said to frequent the shores of the Great Lakes and larger streams. I have never met with it in the field.

One of the above specimens was recorded under the name *G. adelphus* in the Entomological Record, Ann. Rep. Ent. Soc. of Ont., 1906, p. 104.

20. *GOMPHUS BREVIS* (Hagen). Figs. 4, 5.

Ottawa, 1 male; Hull, June 29th, 1886, 1 female (Fletcher); Cumberland, June 16th, 1900, 1 male (Gibson).

Face transversely banded with black, dorsum of thorax, with a pair of broad green or greenish yellow bands widening below. Antehumeral bands interrupted above. Segments 7-9 only moderately dilated.

This short, thick-set species is rather common in Ontario, frequenting well aerated waters, such as rapid streams and the exposed shores of large lakes.

21. *GOMPHUS EXILIS*, Selys. Figs. 6, 7.

Ottawa, 1 male, 1 female (Harrington); Hull, July 13th and 17th, 1907, 3 males, 1 female (Gibson).

Face entirely yellow, length under 45 mm., dull brown banded with greenish yellow, segments 7-9 but little dilated, superior appendages of male with a blunt low inferior process.

This is our commonest Gomphus, frequenting the shores of lakes and streams, especially the more sheltered parts. It is exceedingly abundant on Georgian Bay.

G. spicatus and *G. sordidus* are often associated with *G. exilis*, and both closely resemble the latter in form and coloration. They are larger species (48-50 mm.) and differ from *exilis* further in the structure of the genitalia.

22. *GOMPHUS CORNUTUS*, Tough. Figs. 8, 9.

Ottawa, Mer Bleue, June 18th, 1907, 1 male (Fletcher).

Face entirely yellow: length (male) 57 mm.; dorsum of

thorax yellowish green with a narrow brown streak on each side of the middle line; superior appendages of the male bifurcated, the inferior appendage prolonged into a pair of widely divergent curved processes.

This is the first notice of this remarkable *Gomphus* from Canada. It has also been taken in Illinois and Iowa.

Sub-family CORDULEGASTERINÆ.

Genus CORDULEGASTER Leach.

We have several species of this genus, inhabitants of small creeks and runways from springs. Owing to the nature of their habitat they are local in distribution though *C. maculatus* is sometimes abundant where it occurs.

24. CORDULEGASTER DIASTATOPS Selys.

One male, segs. 6-10 wanting (MacLaughlin).

This species may be known from others of the genus by the eyes not being contiguous above and the abdomen being marked with yellow lateral somewhat triangular spots, their apices directed backwards.

It has also been taken at Port Sidney, Muskoka, with *C. maculatus*. According to Needham the nymph inhabits upland spring bogs.

Sub-family ÆSHNINÆ.

Genus ANAX, Leach.

23. ANAX JUNIUS (Drury), Selys.

Ottawa, May 6th, 1899, 1 male in cop.; June 24th, 1899, 1 male (Fletcher).

This is one of our largest and swiftest dragonflies, and its great size, bright green thorax and blue abdomen render it quite unmistakable for any other species. The blue color, however, is seldom seen in dried specimens and even in life does not develop for some time after the green color of the thorax has been assumed.

It is the first dragonfly to appear in the spring, being on the wing in the vicinity of Toronto as early as the second week in April. It flies throughout May and June, but is seldom seen in July and August, appearing again however in September.

Genus AESHNA, Fabricius.

The members of this genus are the large blue- or green-spotted forms which are often so numerous in late summer and early autumn. The genus is distinguished from the other genera of Aeshninae mentioned here by the fact that the subnodal sector is apically forked, the fork being unsymmetrical.

The North American species are now undergoing a revision by the writer and it has been found necessary to alter the

nomenclature of several species. Until the revision is published it seems best not to make use here of the new names proposed, so that most of the species listed below are indicated only by letters, the names by which they are commonly known being also given. These letters are the same as those used by Williamson in his paper "A collecting trip north of Sault Ste. Marie, Ontario," (Ohio Naturalist, VII, pp. 130-148, 1907).

Several other species besides those listed will almost certainly be found to inhabit the Ottawa district.

25. *AESHNA CONSTRICTA*, Say.

Ottawa, July 26th, 1900, 1 female (Fletcher); 1 female (Harrington).

Anal triangle of male 3-celled; superior appendages of male with a prominent ventral spine near the tip; no black line across the face; first lateral thoracic band rather broad, its anterior margin sinuate, not bordered with black; abdomen of male with large blue spots; appendages of female, 7 mm. long, 2 mm. broad.

A fairly common species in southern Ontario, but apparently does not properly belong to the Boreal Zone.

26. *AESHNA Z.*

Ottawa, August 17th, 1907, 1 female (Fletcher); Hull, beaver meadow, September 14th, 1907, 1 male (Létourneau).

Closely allied to *Ae. constricta* and widely quoted under the latter name, but distinct structurally as well as in coloration.

Anal triangle of male 3-celled; appendages of male as in *constricta*, no black line across the face; lateral thoracic stripes narrower, straight, more or less distinctly bordered with black; spots of male abdomen mostly small and greenish; appendages of female 6-7 mm. long, 1-1.2 mm. broad.

A very common species of wide range, frequenting small streams and pools in the vicinity of woods.

27. *AESHNA Y.*

Ottawa, July 8th, 1899, 1 male (Gibson); 1 male, 1 female (Harrington); Hull, July 17th, 1907, 1 male (Gibson).

Anal triangle of male 2-celled; superior appendages of male with a dorsal carina which bears a few denticles near the apex, the latter acute and bent downwards; no black line across the face; first lateral thoracic band green or blue, strongly sinuate in front and widened below; appendages of female about 5 mm. long, 1 mm. broad.

An abundant species in the Boreal and Transition Zones, appearing early in July and common about lakes and slow streams. It has been hitherto recorded as *Ae. clepsydra*, Say.

28. AESHNA W.

Meach Lake, July 21st, 1907, 1 female (Gibson).

Anal triangle of male 2-celled, superior appendages of male resembling those of *A. Y.* but the apices usually rounded and the denticles less conspicuous; a black line across the face; lateral thoracic bands each divided into 2 spots.

This species has also been quoted as *A. clepsydra*. It seems to be practically restricted to the Boreal Zone east of the Great Plains.

Genus EPIÆSCHNA, Selys.

29. EPIÆSCHNA HEROS (Fabricius) Hagen.

1 female, fragmentary (MacLaughlin).

This immense Dragonfly is rather a rarity in Canada, though commoner farther south. Its huge size (hind wing, male 56, female 60 mm.), and the symmetrically forked sub-nodal sector render it recognizable at a glance.

Genus BASIÆSCHNA, Selys.

30. BASIÆSCHNA JANATA (Say), Selys.

Ottawa, June 11th, 1907, 1 female (Young); Clark's Bush, May 2nd, 1902, 1 female (Gibson); Hull, July 13th, 1907, 1 male (Gibson).

This insect closely resembles the *Aeshna*, but the sub-nodal sector is not forked at the apex. There are two straight oblique yellow bands on each side of the thorax, a brown spot at the base of each wing, and the abdomen is brown, spotted with light blue.

It appears early in the spring and its season is about over when the first *Aeshna* are abroad. It frequents lakes and rivers, flying up and down the edge of the shore in a regular beat.

Genus BOYERIA, MacLachlan.

Our species are easily known by the 2 roundish spots on the sides of the thorax and the dull brownish or greyish coloration.

Until recently, but one North American species has been recognized, but Williamson has described a second very closely allied form, *B. grafiata*, of which a specimen has been received from Ottawa. *B. vinosa* (Say), MacLachlan, is also certain to be met with there, as it is common everywhere in wooded districts along the shores of lakes and streams.

In *B. vinosa* the wings are brownish and there is a distinct dark brown spot at the base of each; the two round spots on the sides of the thorax are yellow and the abdomen is brownish with small obscure pale spots. The appendages of the female are about $1\frac{1}{2}$ times the length of seg. 10.

31. *BOYERIA GRAFIANA*, Williamson.

Ottawa, 1 female (Harrington).

A somewhat more robust insect than *B. vinosa*; wings hyaline with only a trace of the basal brown spots of *vinosa*; lateral thoracic spots pale blue, the first sometimes partly yellowish; abdominal spots blue, larger than in *vinosa*; segments 9-10 of male greenish blue (in *vinosa* 10 is fulvous, 9 brownish); appendages of female about as long as seg. 10.

Family LIBELLULIDÆ.

Antecubitals of first and second series mostly coincident, inner end of pterostigma not supported by an oblique vein.

Sub-family CORDULINÆ.

Hind margin of eyes with a small tubercle, males with an auricle (ear-like projection) on each side of seg. 2, and the anal margin of the hind wing excavated.

The Cordulinæ generally exhibit metallic coloration to a greater or less degree and the wings are seldom spotted beyond the arculus. They are for the most part admirable fliers, and are comparatively seldom seen at rest.

In addition to the species here listed, the following may be expected in the Ottawa district: *Somatochlora elongata* (Scudder) Selys, *S. Williamsoni* Walker, *S. Walshii* (Scudder) Selys, *S. forcipata* (Scudder) Selys and *Cordulia Shurtleffi* Scudder.

Genus DIDYMOPS, Rambur.

32. *DIDYMOPS TRANSVERSA* (Say), Hagen.

Ottawa, July 14th, 1899, 1 male (Gibson); July 9th, 1907, 1 female (Young); 1 male (Harrington); Meach Lake, July 21st, 1907, 1 female (Gibson).

This species, the sole member of the genus, is fairly common in wooded districts, flying along the margins of lakes and woodland streams, much after the manner of *Basiaeschna janata* with which it is often associated.

It is a dull brown, long-legged insect, readily recognized by the single oblique yellowish band on the sides of the thorax and the dull yellow basal spots upon the upper side of the abdomen. These spots, however, are apt to disappear completely in dried specimens. The abdomen of the male is distinctly club-shaped.

Genus MACROMIA, Rambur.

33. *MACROMIA ILLINOIENSIS*, Walsh.

Hull, June 29th, 1886, 1 male (Fletcher).

A fine large dragonfly with clear or flavescent wings and a slender abdomen, club-shaped in the male. Thorax dark metallic green and blue, clothed with pale greyish hairs; a single oblique yellow stripe on each side. Abdomen dark brown, more

or less spotted with yellow and with a large basal yellow spot on the dorsum of seg. 7.

This insect frequents woodland paths and glades in the neighbourhood of large lakes and rapid streams, coursing swiftly back and forth over its chosen path with almost tireless energy. It appears about the end of June or first week in July and remains until the latter part of August.

Genus *NEUROCORDULIA*, Selys. Fig. 10.

34. *NEUROCORDULIA YAMASKANENSIS* (Prov.), Selys.

Ottawa, 1 male (Harrington).

A dull brown dragonfly about 53 mm. long, the hind wings having an amber-colored basal patch with dark-brown veins, extending as far as the arculus. The short sector and upper sector of the triangle in the fore wing are parallel, or slightly divergent, a character which distinguishes it from our other *Cordulinae* in which they are more or less convergent.

This insect appears to be common in the region of lakes between Georgian Bay and Ottawa. It frequents large lakes or rivers and is unique among our dragonflies in its habit of flying only after sunset, when the mayflies upon which it feeds are abroad.

Genus *EPICORDULIA*, Selys.

35. *EPICORDULIA PRINCEPS* (Hagen) Selys.

1 male, fragmentary (MacLaughlin).

This large insect (hind wing, male 41, female 44 mm.), is marked like certain species of *Libellula*, having a large dark-brown triangular patch at the base of the hind wings, and sometimes a smaller basal spot on the fore wings, a nodal and an apical spot. The nodal spot is often absent in the males in northern latitudes, and the apical spot much reduced, and such examples closely resemble an immense *Tetragoneuria*.

It is a swift, restless species which is abroad during July in the vicinity of lakes, often flying at a considerable height, and frequently met with over water some distance from the shore.

Genus *TETRAGONEURIA*, Hagen.

Dragonflies of moderate size with more or less black at the base of the hind wings; only 4 antecubitals in the latter. Abdomen depressed with a row of dull yellow dorsal spots along the margins. The metallic coloration of the thorax is largely obscured by a dense growth of grayish hairs.

36. *TETRAGONEURIA CYNOSURA* (Say), Selys. Figs. 11, 12.

Ottawa, May 30th, 1899, 1 female (Gibson); June 5th, 1903, 1 male (Fletcher); Hull, June 29th, 1886, 1 male (Fletcher).

These specimens all belong to the variety called *semiaquea* in which the black patch at the base of the hind wings reaches beyond the triangle, sometimes as far as the nodus. The typical *cynosura* is found at Toronto with *semiaquea*, but the latter seems to be the only form found in the north. It is exceedingly abundant there, however, occurring in myriads about all the lakes and larger streams during June and July. It is an insect of splendid aerial powers and on sunny days is seldom seen to rest.

The males of this species may be separated from those of *T. spinigera* and *T. canis* by the absence of spines from the superior appendages.

37. TETRAGONEURIA SPINIGERA (Selys) Selys.

1 male, 1 female (MacLaughlin).

This species is generally larger than *cynosura*, and has very little black at the base of the hind wings. The superior appendages of the male bear a small inferior spine.

It is common in the northern parts of Ontario.

38. TETRAGONEURIA CANIS MacLaughlin Figs. 13, 14.

Ottawa, 1 male (Harrington); Chelsea Road, Ottawa, May 27th, 1886, (Fletcher); Hull, June 2nd and 7th, 1903, 3 males (Harrington).

These are the only Canadian specimens I have seen of this species. The males may be known by the form of the superior appendages, which are curved downwards and bear a stout dorsal spine.

This species was recorded by me in the Entomological Record, Ann. Rep. Ent. Soc. of Ont., 1906, as *T. spinosa*, Selys, a closely allied species with which it has apparently been confounded by several writers. The determination *T. canis* was confirmed by Dr. Calvert.

Genus HELOCORDULIA, Needham.

39. HELOCORDULIA UHLERI (Selys), Needham. Figs. 15, 16.

Buckingham, P.Q., May 31st, 1 female (Fletcher).

A rather small Corduline (abd. 29 mm.), olivaceous with a blackish abdomen. Hind wings with a black spot at base extending as far as the first antecubital. Just beyond this is a yellow spot and a few small black ones marking some of the antecubitals.

This dragonfly, which appears in early summer, will probably prove to be fairly common about the lakes and streams of the Laurentian area.

Genus DOROCORDULIA, Needham.

40. DOROCORDULIA LIBERA (Selys), Needham. Fig. 17.

Ottawa, July 7th, 1907, 1 male (Young).

This is the daintiest and most beautiful of our Cordulinae. It is about 40 mm. long, bronze-green with bright green eyes. Segments 3 to 5 are very slender, especially in the male, while 6 to 9 are considerably dilated. The undivided triangle of the fore wings and the form of the male appendages will serve to distinguish it from certain species of an allied genus, *Somatochlora*, representatives of which are sure to be found about Ottawa.

D. libera is found about the marshy borders of lakes in early summer.

Sub-family LIBELLULINÆ.

Hind margin of eyes without a tubercle, males without auricles on segment 2, anal margin of hind wings not excavated.

Most of our familiar dragonflies belong here and are to be found flitting about every pond and marsh.

Among the species not recorded below which may be looked for in the vicinity of Ottawa are *Nannothemis bella* (Uhler) Brauer, *Leucorhinia proxima* Calvert, *L. frigida* Hagen, *L. glacialis* Hagen, *Sympetrum scoticum* (Donovan) Newman, and *Celithemis elisa* (Hagen) Walsh.

Genus LEUCORHINIA, Brittinger.

The species of this northern genus resemble those of *Sympetrum* in form and size, but differ in certain structural details and in coloration. The pterostigma is shorter than in *Sympetrum*, being only about twice as long as broad; the face is pure white, and there is always a few black markings at the base of the wings.

The species appear in the spring or early summer and have for the most part disappeared by the time the *Sympetra* make their appearance.

41. LEUCORHINIA HUDSONICA (Selys) Hagen. Figs. 18, 19.

Hull, June 29th, 1886, 1 female (Fletcher); Eastman's Springs, Ont., May 15th, 1903, 1 female (Fletcher).

This small species is widely distributed in Canada in the Boreal Zone. It is black with irregular yellow blotches on the sides of the thorax and a row of dorsal abdominal spots on segments 2 to 7 or 8. There are two black dashes at the base of the fore wings, another at the base of the hind wings, and behind this is a larger triangular basal spot. The form of the male appendages and vulvar lamina of the female is characteristic.

42. LEUCORHINIA INTACTA (Hagen), Hagen. Figs. 20, 21.

Ottawa, May 24th, 1903, 1 male (Gibson); May 28th, 1904,

1 male (Gibson); 1 male (Taylor); July 5th, 1907, 1 male, 1 female (Young); Hull, June 29th, 1886, 1 male, 1 female.

A blackish insect, segments 2-7 having a row of dorsal yellow spots, which, with exception of the one on 7, disappear in old individuals. Inferior appendage of male deeply bifurcated.

L. intacta is extremely common in southern Ontario where it is the sole representative of the genus. Farther north it is replaced by several others, all of which are characteristic of the Boreal Zone.

Genus SYMPETRUM.

To this genus belongs a number of small red, yellow or brownish dragonflies, mostly with clear unspotted wings, some of which are exceedingly plentiful in late summer and autumn. The pterostigma in our species is three or more times as long as broad, and the base of the wings is without black markings.

43. SYMPETRUM COSTIFERUM (Hagen), Kirby, 1887, (Fletcher).

Ottawa, 1885, (T. J. McLaughlin); Experimental Farm, Ottawa, (det Provancher).

Femora and tibiæ yellow with black on the sides; wings flavescent at the extreme base and usually along the costal margin; superior appendages of male without a prominent inferior tooth; vulvar lamina of female not cleft.

A somewhat local but not uncommon species.

44. SYMPETRUM VICINUM (Hagen), Kirby. Fig. 22.

Ottawa, August 23rd, 1899, 1 female (Gibson).

Femora and tibiæ wholly yellow, wings flavescent only at the extreme base, otherwise it agrees with *costiferum* in the characters given.

S. vicinum is one of our latest dragonflies to disappear and is characteristic of late summer and autumn. It is yellow at first, but later becomes bright red.

45. SYMPETRUM SEMICINCTUM (Say), Kirby.

Ottawa, August 20th, 1885, 1 female; August 27th, 1902, 1 male (Fletcher).

Basal half of the wings brownish yellow, superior appendages of male without a prominent inferior tooth, vulvar lamina of female not cleft.

This pretty little dragon is rather local but sometimes common where it occurs.

46. SYMPETRUM RUBICUNDULUM (Say), Kirby. Figs. 23, 24, 25.

Ottawa, July 14th and 18th, 1899, 2 females (Gibson); Clark's Bush, July 16th, 1907, 1 male (Létourneau).

Wings hyaline or in the so-called variety *assimilatum* (Uhler) more or less flavescent; legs black; superior appendages of male with a prominent inferior tooth; vulvar lamina of female cleft in the middle; genital hamule of male (ventral surface of seg. 2) of the form shewn in figure.

An exceedingly abundant species, flying from early July until November. Young individuals are yellowish, but later become red.

47. *SYMPETRUM OBTRUSUM* (Hagen), Kirby. Fig. 26.

Ottawa, July 16th and 30th, 1907, 2 females (Gibson); August 9th, 1907, 1 male (Létourneau); 1 male, 1 female (Harrington).

Another very common *Sympetrum* which apparently has not yet become quite distinct from *rubicundulum*. Generally, however, there is no difficulty in separating the males by the form of the genital hamules. The face too is paler than in *rubicundulum*, being almost as white as that of a *Leucorhinia*; and the size usually a little smaller.

Genus *ERYTHEMIS*, Hagen.

48. *ERYTHEMIS SIMPLICICOLLIS* (Say), Calvert.

Ottawa, July 19th, 1907, 1 male, 1 female (Young).

A beautiful grass-green dragonfly about 43 mm. long, without thoracic markings, or with only the sutures black; the abdomen mostly brown or black in its apical half. Wings hyaline, pterostigma elongate, pale brown. Old males are pale greyish blue, the thorax and abdomen becoming entirely pruinose.

This species, though common in southern Ontario, will probably not be found in large numbers at Ottawa. It frequents marshy lakes and swamps.

Genus *LIBELLULA*, Linné.

This genus consists of large stout-bodied forms in most of which the wings are more or less conspicuously spotted or banded. The triangle of the fore wings is narrow and very much elongated posteriorly, and is generally crossed by two or more parallel veins. The sexes are alike in wing pattern and the male is without the ventral hooks on the first abdominal segment, which characterize the next genus.

Some of the species are among our most familiar dragonflies and may be seen flitting about every stagnant pond or ditch in midsummer.

49. *LIBELLULA INCESTA*, Hagen.

1 male, 1 female, fragmentary (MacLaughlin).

This *Libellula* is exceptional among Canadian species in having no wing markings except the black pterostigma and an indistinct brownish spot at the extreme apex. The abdomen is more elongate than in the other species. Both sexes become almost entirely bluish pruinose with age.

We have taken this Dragonfly at Point Pelee and at Go Home, Georgian Bay, but it seems to be somewhat rare.

50. *LIBELLULA EXUSTA*, Say.

Ottawa, July 21st, 1907, 1 female (Young); Meach Lake, July 21st, 1907, 1 male, 1 female (Gibson).

This is our smallest *Libellula* and can be distinguished at a glance from our other species by the markings of the wings, in which it resembles a *Leucorhinia*. There is a pair of dark brown streaks at the base of the fore wings, and an anterior streak and posterior triangular spot at the base of the hind wings. The general color is reddish brown, but in old males the dorsum of the thorax and basal third of the abdomen is bluish-white pruinose.

This is an exceedingly abundant insect about the lakes in the Georgian Bay region and probably throughout a large part of the province, but I have not found it about the small ponds and pools frequented by other *Libellulae*.

51. *LIBELLULA LUCTUOSA*, Burm.

Ottawa, July 19th, 1907, 1 male (Young).

A striking species in which the basal third or half of the wings is dark brown, the brown area sometimes margined with white in the males. The apices of the wings are also sometimes brownish.

This species is not uncommon in southern Ontario, but the Ottawa specimen is the only one seen by the writer from the country north of Lake Simcoe.

It is more generally known as *L. basalis*, Say.

52. *LIBELLULA PULCHELLA*, Drury.

Ottawa, July 14th, 1899, 1 female (Gibson); 1 female (Harrington).

Our largest and handsomest *Libellula*, and one of the most familiar of dragonflies.

On each wing there are three dark brown patches, one at the apex, another at the nodus and a longer basal one reaching out to the triangle or a little beyond it. In old males there is a white spot on each side of the nodal spot, giving the insect a striking appearance in the sunlight.

The only insect that might be mistaken for *L. pulchella* is the female of *Plathemis lydia*, which is smaller (hind wing of *lydia* female, 35 mm., of *pulchella* female, 41 mm.), and in which the hind femur is about as long as the tibia, while in *pulchella* it is a little longer.

53. *LIBELLULA QUADRIMACULATA*, Linné.

Ottawa, May 28th, 1900, 1 male (Gibson); July 18th, 1907; 1 male (Létourneau).

Another familiar dragonfly of unmistakable appearance. Yellowish brown or olivaceous; wings yellow at base and generally along the front margin; a small black nodal spot and a larger triangular black spot at the base of the hind wings.

L. quadrimaculata is a northern species and is circumpolar in distribution, being a common species in Europe and Asia as well as North America.

Genus *PLATHEMIS*, Hagen.

54. *PLATHEMIS LYDIA* (Drury), Hagen.

Ottawa, July 21st, 1907, 1 female (Young); Mer Bleue, June 18th, 1907, 1 male (Fletcher).

This is one of the commonest of the larger Libellulidæ in central and southern Ontario, but is scarcer northward.

It exhibits a remarkable sexual dimorphism, the wings of the two sexes being very different in their markings. In the female these are nearly identical with those of *Libellula pulchella*, but in the male the nodal and apical spots are substituted by a single broad band crossing the wing from about the nodus to the pterostigma, the apices being clear. In old males there is a triangular white patch behind the basal stripe of the hind wings and the abdomen is pruinose white.

In habits and flight *P. lydia* is quite like the *Libellulæ*.

EXPLANATION OF PLATE.

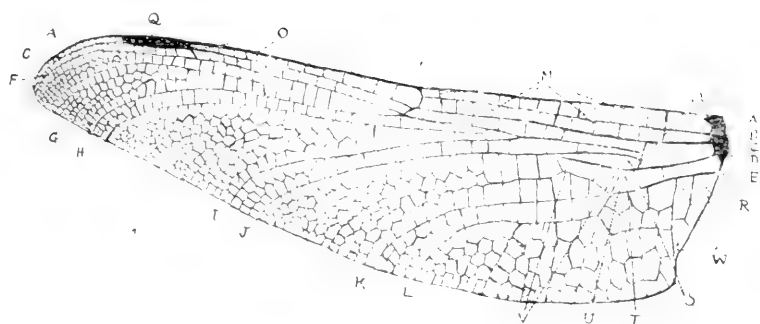
(Fig. 1 is on a smaller scale, Figs. 2, 24 and 26 on a larger scale than the others).

FIG. 1. Hind wing of one of the Anisoptera, *Hagenius brevistylus*.

- | | |
|---|---|
| A. Costa. | O. Postcubitals (13 in the first series, 11 in the second). |
| B. Subcosta. | P. Nodus. |
| C. Median Vein. | Q. Pterostigma. |
| D. Submedian Vein. | R. Basilar space. |
| E. Postcosta. | S. Supra-triangular space. |
| F. Principal Sector. | T. Median space. |
| G. Nodal Sector. | U. Internal triangle. |
| H. Subnodal Sector. | V. Triangle. |
| I. Median Sector. | W. Anal Triangle. |
| J. Short Sector. | |
| K. Upper Sector of the triangle. | |
| L. Lower Sector of the triangle. | |
| M. Arculus. | |
| N. Antecubitals (14 in the first series, 13 in the second, the first and seventh of the former coincident respectively with the first and sixth of the latter). | |

FIG. 2. *Lestes rectangularis* male, abdominal appendages, dorsal view.

- | | | |
|---|-----|---------------|
| 3. <i>Gomphus vastus</i> , male, | " " | lateral view. |
| (after Kellicott). | | |
| 4. <i>Gomphus brevis</i> , male, | " " | dorsal view. |
| 5. " " male, | " " | lateral view. |
| 6. " <i>exilis</i> , male, | " " | dorsal view. |
| 7. " " male, | " " | lateral view. |
| 8. " <i>cornutus</i> , male, | " " | dorsal view. |
| 9. " " male, | " " | lateral view. |
| 10. <i>Neurocordulia yamaskanensis</i> , male, abdominal appendages, dorsal view. | | |
| 11. <i>Tetragoneuria cynosura</i> , male, | " " | dorsal view. |
| 12. " " male, | " " | lateral view. |
| 13. " <i>canis</i> , male, | " " | dorsal view. |
| 14. " " male, | " " | lateral view. |
| 15. <i>Helocordulia Uhleri</i> , male, | " " | dorsal view. |
| (after Martin). | | |
| 16. <i>Helocordulia Uhleri</i> , male, | " " | lateral view. |
| (after Martin). | | |
| 17. <i>Dorocordulia libera</i> , male, | " " | lateral view. |
| 18. <i>Leucorhinia intacta</i> , male, | " " | lateral view. |
| 19. " <i>intacta</i> , female, terminal segments of abdomen from below, showing vulvar lamina (v.). | | |
| 20. <i>Leucorhinia hudsonica</i> , male, abdominal appendages, lateral view. | | |
| 21. " <i>hudsonica</i> , female, vulvar lamina (v.). | | |
| 22. <i>Sympetrum vicinum</i> , male, abdominal appendages, lateral view. | | |
| 23. " <i>rubicundulum</i> , male, abdominal appendages, lateral view. | | |
| 24. <i>Sympetrum rubicundulum</i> , male, left genital hamule. | | |
| 25. " " female, vulvar lamina (v.). | | |
| 26. " <i>obtrusum</i> , male, left genital hamule. | | |



THE DRAGONFLIES OF THE OTTAWA DISTRICT.

WINTER BIRDS OF THE COBALT REGION.

March 14th to 26th of this year the writer spent in New Ontario in the towns along the New Ontario and Temiskaming Railway. Although I did not go there for the purpose that visitors to this region usually go there for, yet it was no vacation tour, but on the contrary, a very busy time for me. Every free moment, however, I spent in looking at the things in nature; especially was I curious to see what birds could be met with here at this time. Whenever I could, I went into the fringe of the woods, mostly dense stands of small black spruce, tamarack and quaking aspen. The tamarack had also here as elsewhere been all killed by the insect that did so much damage a few years before, but some new growth was also seen.

The birds here are few and far between in winter. But since faunal lists from this region are rare, I submit the following list. Unless otherwise noted, they are winter birds, or permanent residents of the region, for, although migration is in progress further south, it was practically the middle of winter here. On March 16th the temperature at Englehart was 6° in day time, but the wind, from north, was certainly much below zero, as it must have been also during the night. The lengthening days were the only token of approaching spring, there was no thawing of snow and ice as yet. The following birds were seen:-

Raven (*Corvus corax principalis*), one, March 16th at Englehart. Reported as rather common at Larder Lake.

Chickadee (*Parus atricapillus*), 5-6 in some pines, exposed to the icy blasts, at Englehart, as lively and satisfied as usual; one singing their sweet: *Peabody*. Seen also in two to three other places; 10-15 on way from Brentha to Heaslip.

Hairy Woodpecker (*Dryobates villosus*), one near Heaslip.

Snowflake (*Passerius nivalis*), flock of about 25 on Lake Temiskaming at Haileybury.

English Sparrow (*Passer domesticus*), abundant at Cobalt, less so at Haileybury. None seen at Englehart and northward.

Canada Jay (*Perisoreus canadensis*), 4-5 seen at Brentha P. O.

I had a very amusing experience with one of these birds, showing their tameness or fearlessness, to which they are probably driven by hunger. A Swiss farmer at Brentha told me, that he had a tame "meatbird" at his place, which would, when called, *Hobie*, fly on his hand and eat out of it. I told him I would come the next morning and

take a picture of it. He remarked it might be too shy for that, or perhaps not come at all in the presence of a stranger. When I arrived there the next morning, the farmer was just out; I entered his little rough log cabin and got some rolled oats or wheat. This I held out in my left hand calling the bird, which had already appeared in a small poplar, sweetly singing all the time. Imagine my surprise, when it flew right straight on my hand, eyed me for a minute, and then commenced eating with all his might. He was so fearless, that I could take a picture of him, manipulating the camera with my right hand. He came repeatedly. Afterwards I also took pictures of him on the farmer's hand. The pictures of the bird on my hand, however, did not turn out well. The object was too near for a snapshot.

Redpoll (*Acanthis linaria*), a flock of 10-15 at Latchford, March 26th.

The following were undoubtedly the first migrants: Am. Golden-eye, (*Clangula americana*) three, one male and two females seen in a ripple in the Montreal River, near the railway bridge at Latchford.

Crow (*Corvus brachyshaichus*), 5 seen at New Liskeard, March 24th, flying straight north. I had seen crows already at North Bay, March 14th, but these at New Liskeard were undoubtedly the first arrivals of their kind in this section.

A person with snowshoes might have seen besides these the ruffed grouse (partridge) and the spruce partridge; also the three-toed woodpeckers, but not many more.

G. EIFRIG.

Ottawa, May 8th, 1908.

REVIEW OF DR. J. M. CLARKE'S GEOLOGY OF A PORTION OF GASPE PENINSULA, QUE.

By H. M. AMI.

"Early Devonian History of North-Eastern North America." Memoir 9. New York State Museum, New York State Education Department, 366 pp., 48 plates, sections, diagrams, maps, etc. Albany, 1908, by J. M. Clarke, State Geologist and Director of the New York State Museum.

In this magnificent Memoir, with its princely plates and exquisite illustrations, the State of New York has once more shewn the world how far science and art has reached towards a realization of satisfactory results in describing and illustrating the hard facts of Geology in an orderly and delightful manner.

To the student of palæontology and stratigraphical geology, this handsome contribution to the history of early Devonian times will be most welcome. It fills a long-felt want, and serves to tie together a number of faunas and formations with others in the State of New York, as well as beyond. Science, and geology especially, knows no political boundaries. As Dr. Clarke very aptly puts it, "The New York series of formations spreads away from its typical region to all points of the compass, and in all these directions, however far it extends, light is to be sought for the explanation of past geologic conditions in New York." "Nevertheless, the State . . . does not and never can in itself afford the solution of its own problems." Prof. James Hall, for the sixty-three years that he was in office at Albany had shewn that the New York series extended beyond the limits of New York State. The standard laid down by the fathers of geology in North-Eastern America, Hall, Logan, Dana, Billings, Emmons and many others, were to be kept high and to the fore.

The subject matter dealt by the distinguished successor to James Hall in the Memoir before me was obtained by Dr. Clarke in the Peninsula of Gaspé, in South-Eastern Quebec. After describing the general distribution of the "Early Devonian of New York" and pointing out their extension north and east, then sets to the task of giving the geology of the region covered by the Memoir. The geology of the Forillon, of Percé, (a brief sketch of which had appeared in 1903 in advance sheets from the report of the Palæontologist, 1904, and in Bulletin 107, Geological Papers, Albany, 1907), the Gaspé sandstones, etc., are followed by descriptions of the various faunas. Three distinct faunas are noticed, and their rich harvest of forms, new to science, or recorded afresh, constitute the bulk of the material on which the Memoir is based. They are as follows:—

- I. Fauna of the St. Alban beds. Forty-eight species.
- II. Fauna of the Cape Bon Ami beds. Of this fauna eleven species are recorded.
- III. Fauna of the Grande Grève limestones. One hundred and sixty species.

Observations on the Dalmanites of the early Devonian are introduced in the text which throw light upon race character-

istics, debility, as exemplified in ornamentation of different parts of the organism *Gaspelichas Forillonia*, a new species, is indeed "the most extravagant instance of the development of spines among the trilobites."

This monumental work by Dr. Clark only serves to enhance his deserved fame as a distinguished palæozoic palæontologist. The plates are all that can be desired, the text likewise so satisfactory, both as to quality and precision. References are made to the good work done in the peninsula by Logan, Billings, Ells, Low and others whom the author does not forget in bestowing names on the new forms met with. Nor does he forget those intrepid missionaries and early French explorers like Lejeune, Jumeau, Lescarbot, Leclercq and de Thune, and the Jerseymen and other settlers of the district, all who have in any measure contributed to the history and development of Gaspé.

The geology of the "Forillon" with map, is given in which the Gaspé sandstones, the Grande Grève limestones, the Cape Bon Ami beds and the St. Alban beds are separated on palæontological and stratigraphical grounds. This remarkable point juts out into the Gulf of St. Lawrence "like an index finger," from the broad fist of Rosier Cape and Cove, and two of the four geological formations constitute the narrower portion of the slender point, with Cape Gaspé to the north and Shiphead to the south. The vertical distribution of species, the faunas of the different formations and their mode of occurrence, together with a special chapter on the "Geology of Percé," in which a geological map in detail, is presented giving the succession of the strata, including formations from the Carboniferous down to the Lower Silurian. They comprise the Bonaventure conglomerate (Carboniferous and Devonian in age), the "Percé massive" (Lower Devonian), the Cap Barré massive, (Lowest Devonian), Mt. Joli massive, north flank, (Upper Silurian), Mt. Joli massive, south flank, (Lower Silurian), Cape Canon massive, including limekiln beds, (Lower Silurian). The faults noted by Dr. Clarke appear to be of the same character as those of the "Quebec Group" and "Appalachian" folded region, a series of thrust faults, very much like those movements so characteristically described by Lugeon of Switzerland, where strata seem to play leap-frog one over the other. Their reproduction of a number of old historic maps and early illustrations of this most interesting and picturesque, as well as easily reached region, forms no inconspicuous portion of the volume, nor can the delightful water-colour reproduction of Percé rock, forming the frontispiece, go unnoticed. The excellent drawings by Barkentin illustrating the extinct faunas are exquisitely reproduced.

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FAUNA OTTAWAENSIS.

HYMENOPTERA—Superfamily III—VESPOIDEA.

By W. Hague Harrington, F.R.S.C., Ottawa.

In Volume XV a list was published of eighty-one species of Ottawa wasps, belonging to the superfamily Sphegoidea, and the following list gives an equal number of the species included in the adjoining Vespoidea. This superfamily contains sixteen families, of which nine are represented in the list. Some of the remaining families have representatives in Canada, but these are mostly western forms, such as *Trigonalis* and *Masaris*, and it is probable that *Sapyga* is the only form which may be expected to occur in this district. For those who have not made a study of the numberless interesting forms belonging to our Hymenoptera, a few introductory remarks on the appearance and habits of the members of the several families may prove of more interest than the list itself.

The *Ceropalidæ* (*Pompilidæ*) are mostly small, or medium-sized black wasps, with frequently bluish or purplish reflections and occasionally with red or white markings, while the wings may be clear, smoky or maculate. They are very swift and agile insects, and the females, in common with those of other families, have stings which, especially in the larger species, can inflict a painful wound. *Anoplius* (*Pompilus*) and *Salius* (*Priocnemis*) fill their burrows in the ground with spiders, which they will take even out of their webs. The species of *Agencia*, which are smaller, construct mud nests in which they also store spiders. The spiders thus provided for the offspring of the genera mentioned are rendered immobile by the stings of their captor and often have their legs nipped off so that they may be more easily stowed in the nests. The wasp then lays an egg in the cell and seals it up. The members of the genus *Ceropales* are parasitic upon the other genera, the females watching for an opportunity to place their eggs in the nests which are being provisioned.

The *Vespidæ* are the typical Social Wasps, the "yellow-

jackets" and "white-faced hornets" whose stings are so much feared by marauding youngsters bent on destroying their colonies. They are the original pulp and paper-makers, and the nests of some species are very large and conspicuous objects attached to trees or buildings. Some of the species construct their homes in hollow trees or in holes in the ground. No matter how large a nest may be, it results from the initiative energy of one individual and is the work of one season, at the close of which it is deserted. The founder is a fertilized female which, after passing our long cold winter, say November to April inclusive, in a rotten log or other suitable retreat, emerges with the return of revivifying spring and at once starts the foundation of a colony. Gnawing off a little bundle of fibres from the nearest old fence, telegraph pole, or other convenient dead wood, she masticates and works them into a pulp with which a cell is commenced. As soon as a few cells are completed an egg is placed in each, and daily the nest grows larger by the constant addition of cells and protective covering. After a few days the eggs commence to hatch and the mother wasp has to toil more assiduously than ever to keep her establishment going. As the days lengthen and grow warmer so are her labours prolonged and intensified. In addition to paper-making and house-building, she has now to provide suitable nutrition for a constantly increasing family of voracious larvæ. The food for these consists chiefly of macerated insects and each grub, hanging head downward in its cell has to be separately fed. Flies form the chief prey of the wasp and, fortunately for her, these are now abundant. As so many of the diptera are obnoxious, the labours of the wasp tend to benefit us indirectly. Juices of fruits, especially of over-ripe or injured ones, are attractive to the yellow-jackets, but any loss which they may inflict in gathering the sugary secretions is abundantly compensated for by the destruction of innumerable flies attacking plants and animals. At the end of four weeks from oviposition the young wasps have passed through their various stages and are able henceforth to assist in the various duties of the establishment. They are all sterile, or imperfectly developed females, which are known as workers, and which are smaller than the queen mother. The latter is gradually relieved from the gathering of building and food supplies, and remains chiefly in the nest, placing her eggs in the cells as they are built or emptied. The continuance of the colony is now more assured than when the queen was exposed to the dangers which daily beset her when flying abroad. Workers are now constantly maturing and the nest increases in size, until it may be as large as a football, and contain several discs of comb suspended one below the other,

the cells opening downward, within the protecting oval coverings. As the summer draws to a close, larger cells are constructed and males and perfect females are developed. After mating the males gradually perish, and the whole colony succumbs to cold and starvation, with the exception of such females as may find suitable hibernating quarters and survive to found new colonies next year. Notwithstanding their fierce dispositions and venomous stings, the wasps cannot protect their nests from parasitic intruders. Forty years ago Mr. W. Couper, who then resided in Ottawa, bred from a nest of *V. maculata* a tryphonid which was sent by Mr. Billings to Mr. Cresson, who described it in the Canadian Entomologist, Vol. I, page 104, under the name *Euceros burrus*. The species has been redescribed by Rev. J. L. Zabriskie as *Sphecophagus* (?) *predator*, and more recently has been referred to the genus *Cacotropa* by Mr. Davis. Dr. Fletcher has found apparently the same species, though varying somewhat in coloration, abundant in nests of *V. diabolica*. *Polistes* belongs also to the social wasps, but its colonies are small. The nest consists of only one layer of cells, without any covering, and is attached to the under side of a stone, or occasionally in buildings or in some other sheltered situation. A nest recently found (19th April, 1908), under a flat stone in a sandy field, consists of 98 cells and was attached by a large central pedicel and several small ones around the edge. Between the nest and the stone a lively female wasp was found which had apparently hibernated there and which might possibly have used the nest again instead of starting a new one.

The Eumenidæ have longitudinally folded wings like the Vespidæ, but are smaller wasps which are solitary in their habits and are not paper-makers. All our species are black, with yellowish or whitish markings, and are abundant at the end of summer on *Spiræa*, golden rod, etc., in common with many of our other wasps which may then be easily captured. Eumenes has a petiolated abdomen and constructs of clay a curious little vase-shaped nest attached to twigs. The cell is provisioned with small caterpillars, of which those called loopers or measuring-worms seem to be preferred, and the egg is suspended from the top of the cell by a slender thread so that it may not be crushed by the moving about of the caterpillars. The rest of our Eumenidæ are included in the extensive genus *Odynerus* which contains according to the *Genera Insectorum* 796 described species. The twelve Ottawa species are divided equally between the three subgenera *Leionotus* (Nos. 37-40), *Ancistrocerus* (Nos. 41-44) and *Symmorphus* (Nos. 45-48). Their nesting habits are varied; some building clay cells under stones or in

crevices, some forming cells in the hollow, or excavated stems of plants in which only the partitions are of mud, and others making their nests in burrows in the ground. Like *Eumenes* they provision their cells with caterpillars, but much yet remains to be learned regarding the habits of our species.

The Chrysididæ are parasitic insects nourished in the cells of various bees and wasps. The female Chrysid watches for a chance to deposit her egg in a nest which is being stored by her unwilling host, and the resulting larva either devours that of the host or starves it by using up the food supply. From their parasitic habits they are known as "cuckoo bees" or, more properly, "cuckoo wasps," and from their brilliant colours are also called "ruby-flies." Our species are all small insects, seldom over one quarter of an inch long, of a deep metallic blue colour, varied with red, purple or green tints. The abdomen has fewer visible segments than in the other wasps, and is excavated beneath so that the wasp can roll itself into a ball, when attacked by the insect whose nest it invades, and be quite safe against injury. They are exceedingly active insects, and are often seen exploring the trunks of trees, the crevices of rocks, or the surface of the ground for the nest of the species which they infest.

The Bethyloidæ are small ant-like insects which were formerly classed as subfamilies of the Proctotrypidæ, but which are now considered as more closely allied to the wasps, and have been placed as one of the families of the Vespoidea. The members of the subfamily Bethyloidæ are parasitic upon coleopterous and lepidopterous larvæ, while those of the Dryininæ feed upon immature Homoptera, chiefly fulgorids, membracids and jassids. In both subfamilies the females are frequently wingless, and the females of the Dryininæ have curious chelate anterior tarsi, probably to enable them to cling to the insects on which their eggs are placed.

The Tiphidæ are represented by only two species of rather large shortlegged black wasps which belong to the genus *Tiphia*. The members of the family, which was formerly included in the Scoliidæ, are parasitic upon the larvæ of ground-inhabiting beetles.

The few remaining species of our Vespoidea belong to the families Thynnidæ, Myrmosidæ and Mutillidæ; the first two families being considered by many authors as only subfamilies of Mutillidæ. These groups are very poorly represented in our fauna and the few species which do occur are usually rare. The females are all wingless and resemble ants in general appearance, but the males are winged and differ much in form from the females, and are black while the females may be variegated in colour. These

insects are parasites of various nest forming hymenoptera and the larva is stated to attach itself to that of its host and to complete its growth at the cost of its victim's life.

Family XXVII.—*Ceropalidae*.

Subfamily I.—*Pepsinæ*.

1. *Salius nebulosus*, Dahlb. Our largest species of which only one female has been taken.
2. *Salius conicus*, Say. A black wasp with fuliginous wings, common in midsummer; 8 females, 1 male.
3. *Salius germanus*, Cress. A small form of which one female was taken near Hull on 29th July, 1894.
4. *Salius alienatus*, Say. This is a pretty little species with abdomen partly red; the wings clear, with a dark patch on the front ones; 7 females in June and July.
5. *Salius nothus*, Cress. Resembles the forgoing but has no patch on wings; 1 female only taken.

Subfamily II.—*Ageniinæ*.

6. *Agenia architecta*, Say. A small bluish clear-winged species reared from small clay cells built under stones; 6 females and 2 males.
7. *Agenia pulchripennis*, Cress. This handsome polished black species with bimaculate wings is not uncommon; 6 females, 1 male.
8. *Agenia bombycina*, Cress. A slender clear-winged insect determined for me by Mr. J. C. Bridwell; 3 males.
9. *Agenia atrata*, Prov. Both sexes of this insect were described from specimens collected by Mr. Guignard near Hull; not represented in my collection.
10. *Agenia pulchrina*, Cress. One female taken 8th July, 1894, determined by Bridwell.
11. *Agenia calcarata*, Cress. A small species with pale legs; 3 males. One of these, received from Mr. Guignard, is labelled *Ceropales nigricoxis*, Prov., female, but I do not find any species described under that name, and Provancher credits Guignard with having sent to him the male of *A. calcarata*.
12. *Agenia rufigastrea*, Prov. This species, with red abdomen, was described from a female taken by Guignard near Hull. I have not found it yet.

Subfamily III.—*Aporinæ*.

13. *Anoplius æthiops*, Cress. This is our largest species of the family and is a fine velvety black insect with dark wings. It is also a strong and vigorous foe of our larger spiders.
14. *Anoplius biguttatus*, Fabr. This is one of the commonest species, and is readily recognized by the white markings (varying in number) on the abdomen, although unspotted individuals occur. The species is very variable in size; 8 females and 3 males.

15. *Anoplius* n.sp.? Two specimens sent some years ago to Dr. Fox were stated to be a new species (?) near *biguttatus*.
16. *Anoplius scelestus*, Cress. A purplish-black species with smoky wings (not so dark as those of No. 13); 4 females 2 males.
17. *Anoplius luctuosus*, Cress. Closely resembles the preceding but has paler wings; 7 females, 4 males.
18. *Anoplius hyacinthus*, Cress. With bluish or purplish reflections; 3 females, 2 males.
19. *Anoplius angustatus*, Cress. A purplish, dark-winged insect, of which only one male has been taken.
20. *Anoplius cylindricus*, Cress. This is a smaller and slender species represented by 3 males.
21. *Anoplius virginienensis*, Cress. A somewhat common slender species; 6 males.
22. *Anoplius americanus*, Beauv. This insect has the first and second segments of abdomen red; 1 female.
23. *Anoplius tenebrosus*, Cress. Appears to be a common species but males seem rare; 6 females.
24. *Anoplius marginatus*, Say. An abundant and pretty species with an orange or red band on the second segment of abdomen. It resembles No. 22, but has the third submarginal cell distinctly petiolate instead of merely narrowed toward the marginal; 12 females and 1 male.
25. *Anoplius parvus*, Cress.? A specimen received from Guignard is labelled as the male of this species determined by Provancher. It is, however, a female and does not agree very well with Cresson's description, except in size.
26. *Anoplius* n.sp. Two specimens sent to Dr. Fox were so determined by him. One male also yet in my collection.

Subfamily VI.—*Ceropalinæ*.

27. *Ceropales bipunctata*, Say. This is a large handsome species with very long hind legs, the femora of which are conspicuously red. One year it was abundant in the Beaver Meadow (Hull) on the flowers of *Spiraea*, but since then I have only taken one male.
28. *Ceropales fraterna*, Smith. A smaller species which is gaily banded and spotted with yellow. It is abundant and varies greatly in size. It has been reared from the nests of *Anoplius luctuosus*. *C. minima*, Prov. described from one of Guignard's specimens is evidently only one of the small males, and one of my females is not much larger; 3 males and 7 females.
29. *Ceropales Robinsoni*, Cress. One female received from Guignard, determined by Provancher as his *C. superba*. It is a very fine insect; thorax and head black with yellow markings and silvery pubescence; abdomen and legs red.

Family XXVIII.—*Vespidæ*.

Subfamily I.—*Vespinæ*.

30. *Vespa diabolica*, Sauss. This is our commonest yellow-jacket and constructs its nests even attached to houses or in barns, etc.; 9 females, 7 workers and 6 males.

31. *Vespa borealis*, Kirby. The markings of this wasp are similar to those of the preceding species but are white instead of yellow. It is probably a dimorphic form as Dr. Fletcher found both species inhabiting a nest attached to his house at the Experimental Farm, and also in a nest at Meach Lake; 1 female, 5 males.
32. *Vespa maculata*, Linn. This is our largest wasp and is the so-called "white-faced hornet." In Harper (January, 1908) there is an interesting illustrated article by Dr. McCook on the nest-building of this species; 1 male and 5 females.
33. *Vespa arenaria*, Fabr. (*marginata*, Kirby) is also black and white, but is easily recognized by its smaller size and paler legs. It seems to be rare here; 2 females and 2 workers.
34. *Vespa germanica*, Fabr. This species closely resembles No. 30 in its conspicuous black and yellow livery, but it builds its nest under ground and is not so common; 2 females, 1 worker.
35. *Polistes pallipes*, St. Farg. This is a common black and yellow wasp which is longer and slenderer than the species of *Vespa*. In the autumn it may be often found sunning itself on the walls of houses or on fences. Nest usually found under stones; 3 females, 4 workers, 1 male.

Family XXIX.—Eumenidae.

36. *Eumenes globulosus*, Sauss. A common and easily recognized species; 4 females, 6 males.
37. *Odynerus pennsylvanicus*, Sauss. This small species appears to be common; 3 females, 8 males.
38. *Odynerus leucomelas*, Sauss. One of our largest white-banded species and abundant; 5 females and 12 males.
39. *Odynerus foraminatus*, Sauss. Closely resembles the preceding species but the markings are yellow; 4 females, 7 males.
40. *Odynerus* sp. One small female determined by Mr. Bridwell as near *mohicanus*, Sauss. It may be only a variety of No. 37.
41. *Odynerus capra*, Sauss. One of our largest forms with bright yellow markings; 5 females, 6 males.
42. *Odynerus albophaleratus*, Sauss. A smaller species with white markings, which is one of our commonest forms; 7 females, 11 males.
43. *Odynerus catskillensis*, Sauss. Resembles very closely the preceding but the markings are yellow; 13 females, 9 males. One of the females has attached a female of the parasite *Xenos*.
44. *Odynerus tigris*, Sauss. This is a small species of which I have only 4 males.
45. *Odynerus philadelphiae*, Sauss. A medium sized slender species which is not common; 5 females and 3 males.
46. *Odynerus debilis*, Sauss. Our smallest and slenderest species, and one of the commonest; 7 females, 15 males.
47. *Odynerus Walshianus*, Sauss. This seems to be a rare species as only one female has been taken.
48. *Odynerus albomarginatus*, Sauss. Differs from the three preceding species in having white markings; 2 males only taken.

Family XXXI.—**Chrysididae.**Subfamily II.—*Chrysidinæ.*

49. *Tetrachrysis Nortoni*, Aaron. Four specimens.
50. *Tetrachrysis cœrulans*, Fabr. One of our commonest species and varies considerably in size and colour; 12 specimens.
51. *Tetrachrysis nitidula*, Fabr. Closely resembles the preceding species, and some individuals are difficult to separate. Fourteen specimens, of which one was bred from the cells of an *Odynerus*.
52. *Tetrachrysis aurichalcea*, Prov. This species should perhaps be placed in *Dichrysis*, as Aaron placed it in his group, distinguished by having two apical teeth. Provancher, however, in describing the species states that the apical border of the abdomen is cut into four teeth. The lateral ones are not prominent, being rather angles than teeth. This is our most beautiful species and our only real "ruby-tail." The abdomen of my only specimen (a female) is of a golden bronze, with ruby reflections. The male has been taken by Mr. Guignard.
53. *Trichrysis parvula*, Fabr. Four specimens, of which two were reared from the clay-built cells of *Pelopæus cementarius*, Drury, our common mud-dauber wasp.
54. *Gonochrysis perpulchra*, Cress. This is a somewhat more robust and greener species than the preceding forms, and the apex of abdomen is notched instead of dentate. Nine specimens.
55. *Chrysogona verticalis*, Cress. This is a small insect which seems to be abundant; 9 specimens.
56. *Chrysogona hilaris*, Dahlb. Provancher credits me with having sent to him a female of this species, which differs from *verticalis* chiefly in the absence of a carina above the frontal basin.

Subfamily III.—*Hedychrinæ.*

57. *Holopyga ventralis*, Say. Five specimens.
58. *Hedychrum violaceum*, Brullé. Three specimens. This species closely resembles the preceding in its compact, robust shape, but is smaller, and is easily separated by the differently toothed claws.

Subfamily IV.—*Elampinæ.*

59. *Notozus viridicyaneus*, Norton. Two specimens; one taken 6th June, the other received from Mr. Guignard, and determined by Provancher.
60. *Notozus marginatus*, Patton. A smaller species which also seems rare. Three specimens, of which one was received from Mr. Guignard. Determinations by Provancher and Bridwell.
61. *Notozus nitidus*, Aaron. Provancher records this species from Ottawa. The types were from Montana and California.
62. *Elampus speculum*, Say. Also rare, only two specimens, captured 14th and 30th June.
63. *Elampus Cressoni*, Aaron. Provancher credits Ottawa with this closely allied species.

64. *Diplorrus plicatus*, Aaron. One specimen taken 20th June and determined by Mr. Bridwell. This is a small insect with black abdomen, which was described from specimens from Montana and Colorado. Dr. Fletcher took a specimen in July, 1895, at Winnipeg, the only other Canadian record.
65. *Omalus iridescens*, Nort. Seven specimens, captured chiefly in June.
66. *Omalus laeviventris*, Cress. Four specimens.
67. *Omalus corruscans*, Nort. Six specimens. This species is the largest of our representatives of the genus.
68. *Omalus sinuosus*, Say. This is a common species and variable in size. It is of a violet or purplish bronze colour, the thorax being redder than the abdomen, and was named by Provancher for this reason *purpurascens*. Nineteen specimens, of which nine were taken on the same day (2nd June).

Subfamily VI.—*Cleptina*.

69. *Cleptes speciosa*, Aaron. This beautiful little insect was described from Montana, and in his Additions, etc., is recorded by Provancher as sent from Ottawa by me. It does not appear in my collection.

Family XXXII.—*Bethylidae*.

Subfamily I.—*Bethylinae*.

70. *Isobrachium myrmecophilum*, Ashm. One male taken at old race course (Glebe) 22nd August, 1894.
71. *Mesitius bifoveolatus*, Ashm. Three females taken in May and August.
72. *Anoxus Chittendenii*, Ashm. One male taken near Hull, 28th July.
73. *Perisemus formicoides*, Prov. One male (the type). The species is perhaps only a variety of the next one.
74. *Perisemus prolongatus*, Prov. Eight females and one male taken May to August.
75. *Goniozus foveolatus*, Ashm. One female and two males, taken in June, July and August.

Subfamily III.—*Dryininae*.

76. *Gonatopus contortulus*, Patton. One female taken 29th July.
77. *Gonatopus flavifrons*, Ashm. One female taken in Beaver Meadow, Hull, on 15th July.
78. *Chelogyne canadensis*, Ashm. One female taken 4th June. The type in Coll. Ashmead was also from Ottawa.
79. *Anteon politus*, Ashm. Three females taken in July and August.
80. *Aphelopus melaleucus*, Dal. One male now in Coll. Ashmead. This is a European parasite of *Typlocyba*.

Family XXXVII.—**Tiphiidae.**

81. *Tiphia inornata*, Say. A large black wasp which is not uncommon. Females are about two-thirds of an inch long, but the males are much smaller. It is parasitic upon the larvae of June-beetles (*Lachnosterna*) known as "white grubs," and its parchment-like cocoon, an inch long, may be found sometimes in the ground infested by these grubs. Six females, nine males.
82. *Tiphia tarda*, Say. This is a much smaller species and apparently rare, as I have only taken one female (upon a pine tree) and one male. Mr. Guignard also sent a male to Provancher.

Family XL.—**Thynnidae.**Subfamily II.—*Methocinae*.

83. *Methoca bicolor*, Say. This insect looks like a large slender reddish ant. Two females, of which one was taken 8th July, 1887, and the other was received from Dr. Fletcher.
84. *Methoca stygia*, Say. This is a larger, winged, entirely black insect, probably the male of the preceding species, though differing so greatly in appearance. One male taken on 22nd July.

Family XLI.—**Myrmosidae.**Subfamily II.—*Myrmosinae*.

85. *Myrmosa unicolor*, Say. A rugose, rather pubescent black insect which is considered to be the male of *M. thoracica*, Blake, which has not yet been taken here. Four males, June to August.

Family XLII.—**Multillidae.**Subfamily I.—*Multillinae*.

86. *Pseudomethoca canadensis*, Blake. The females of this species are moderately abundant, and are found running about on the ground on sandy soils where grass and other vegetation is scanty. They resemble stout, reddish ants, with bands of pubescence on the abdomen. The winged males are black and slenderer, and are the *Photopsis Cressoni* of Fox, by whom the species was determined for me. Twelve females, from May to September, and three males in August.
87. *Photopsis canadensis*, Prov. This species was described from a male contributed by me from Ottawa, but has not occurred again. It differs from the preceding species in having yellow legs.

COUNCIL MEETING.

A meeting of the Council was held in the Carnegie Library on May 13th, with the President, Mr. Attwood in the chair. Other members present were Miss M. B. Williams, Messrs. A. Halkett, A. Gibson, C. H. Young, E. E. Lemieux, L. H. Newman, and T. E. Clarke.

The following were elected ordinary members:—

E. A. LeSueur, Ottawa.

J. W. Jones, Macdonald College, Ste. Anne de Bellevue.

F. C. Hart, B.S.A., Galt.

Dr. John Brittain, Macdonald College, Ste. Anne de Bellevue.

Mr. C. Rose, Ottawa.

Mr. A. Gordon Spencer, Ottawa.

Mr. C. A. Crabtree, Ottawa.

Mr. Arthur Gibson was appointed to act as Editor of The Ottawa Naturalist during the absence of Mr. Macoun from the city.

By formal motion, the Council expressed its opinion that the Editor of The Ottawa Naturalist should be a member of the Council.

T. E. C.

EXCURSIONS.

Owing to the inclemency of the weather, the excursion of the Club, which was to have been held at Aylmer Park, on the afternoon of Saturday the 9th of May, was cancelled, and the members met instead at the Fisheries Museum.

Mr. A. E. Attwood, President of the Club, was in charge, and about thirty members attended. Much interest was displayed in looking at the various aquatic specimens of natural history which this institution contains, and which have been brought together from many parts of the Dominion. Many questions were asked in regard to the structure, development, habits and environments of the various kinds of fishes and other denizens of the sea, lakes, and rivers, specimens of which are on exhibition in this institution. Great interest was taken in a specimen of Octopus from the coast of British Columbia.

After spending an hour or so in the Museum, the members went down to the basement of the building and viewed the Fish-hatchery, and were shewn the process of hatching out the fry of the white-fish, the speckled-trout, the salmon-trout and the Atlantic salmon.

Altogether a pleasant and instructive time, occupying some two hours, was spent; and those who attended expressed themselves as well satisfied with their visit.

A. H.

BOTANICAL NOTE.

TWO NEWLY INTRODUCED EUROPEAN FLANTS.

Among some plants recently presented to the herbarium at the Central Experimental Farm by the Rev. Brother Marie Victorin of Longueuil College, Que., were specimens of two introduced European species, which are of more than usual interest, viz.: the beautiful so called Flowering-rush, *Butomus umbellatus*, L. and the strong-smelling Danewort or Ground Elder, *Sambucus Ebulus*, L. These two plants are easily recognized. *Butomus* is a water plant of great beauty, which is classified by some botanists with the Water-plantain Family, the Alismaceæ and is there placed in the "Hand-list of Herbaceous Plants of the Royal Botanic Gardens", Kew (England), 1902, but in Gaston Bonnier's "Flore complète de la France" the Butomeæ are ranked as a separate family on account of their nine stamens. The genus *Butomus* is interesting also from the fact that it bears ovules all over the internal surface of its carpels. *Butomus umbellatus* is referred to by the eminent English botanist, Dr. Leo. H. Grindon, as "one of the handsomest plants England produces. It is well-known under the erroneous name of Flowering-rush and is frequently cultivated in botanic gardens." This plant has tall stems two to four feet high, bearing at the summit of each a large umbel of showy rosy-red flowers. The peduncles are from three to four inches long, and each bears three rosy petals and three similarly coloured sepals, which inclose six carpels and nine stamens. The leaves are linear, two to three feet long, acutely three-edged and more or less spirally twisted at the tips. Brother Victorin writes that he first collected this species about two years ago, when it was identified for him by his confrère the Rev. Brother Roland Germain, who knew it well in France. The first specimens were found at Laprairie on the St. Lawrence River, opposite to Montreal, in 1905, then in 1906 at Longueuil and Beauharnois, and in 1907 at Chateauguay. Brother Victorin believes that it also grows around the Boucherville Islands, a few miles below Longueuil. The Rev. Professor Oliver of Mont St. Louis, Montreal, has found the plant at Valois on the Island of Montreal. Brother Victorin feels confident that *Butomus* ripens its seeds at Longueuil, and this certainly seems to be the case from specimens which he has forwarded. The plant grows there to a considerable height, notwithstanding the late date at which the water recedes from the river flats where it occurs, so that it cannot appear above the surface

until rather late in June. It is found associated with various species of *Juncus*, *Scirpus americanus*, Pers., the Wild Rice (*Zizania aquatica*, L.), Silverweed (*Potentilla Anserina*, L.), Wild Pennyroyal (*Mentha canadensis*, L.), Cocklebur (*Xanthium canadense*, Mil.), Bugleweed (*Lycopus virginicus*, L.), Arrowhead (*Sagittaria variabilis*, Englm.).

The Danewort, *Sambucus Ebulus*, has, so far, only been found by Brother Victorin at one place, on the side of a ditch which crosses the "Bord de l'eau" road between Longueuil and Boucherville. It grows there vigorously and in abundance. This is not a very attractive plant. It is practically a herbaceous perennial Elder, the coarse, grooved stems of which, from two to three feet high, die down every year. The leaves consist of from seven to eleven lanceolate leaflets, and have at the base of the petiole conspicuous green stipules, a character by which the species may be readily distinguished. The flowers are white, tipped with pink, and the cymes have three main branches. This is not nearly as desirable an introduction as the showy aquatic Flowering-rush, on account of its rank odour and its aggressive mode of growth. We have had the plant growing for some years in the Botanical Garden at the Central Experimental Farm, and Mr. W. T. Macoun tells me that it requires constant attention to prevent it from becoming a troublesome weed.

J. FLETCHER.

NEW BIRDS FOR BRITISH COLUMBIA.

Mr. Charles de Blois Green, of Fairview, British Columbia, has been working energetically this season on the birds of the Lower Okanagan Valley, and has added no less than three species to the Canadian list; these are: the White-throated Swift, the Canyon Wren and the Sage Thrasher, and all have been found breeding near Mr. Green's home.

Years ago Mr. Green collected the butterflies and moths of the Okanagan Valley, and added several new species of butterflies to the Canadian list. I. F.

REPORT ON A COLLECTION OF FOSSIL WOODS FROM
THE CRETACEOUS OF ALBERTA.

By D. P. Penhallow, D.Sc., F.R.S.C., F.G.S.A.

Early in the present year, Mr. L. M. Lambe, of the Geological Survey, placed in my hands a specimen of fossil wood for determination. It was without number, but it was described as having been collected by Mr. Milliken from the Edmonton Series of the Red Deer River, 100 miles west of Gleichen, Alberta.

At a later date, Mr. Lambe sent me six additional specimens for determination. These were all reported as derived from the Judith River (Belly River) Series of the Red Deer River, Alberta. The catalogue numbers on the specimens correspond to the following general description:—

Nos. 275, 276, 319 and 330—Silicified woods.

No. 838—Silicified wood not determinable in consequence of extended decay and distortion of structure.

No. 1676—A longitudinal section of a cone.

PICEA ALBERTENSIS, N. SP.

The specimen numbered 1676, is a longitudinal section of a cone, the basal portion of which has been removed. As found, it measures 38 mm. in its greatest length, and 18 mm. in its greatest width. The upper end is complete, and the general structure is also intact within the limits of the specimen. The basal portion of the cone appears to have been carried away by fracture of the matrix.

The character of the specimen does not admit of full determination, but the shape immediately suggests comparison with a cone of *Picea*, while both the size and general outline invite comparison with *P. columbiensis*, Penh., recently described as having been obtained by Dr. R. A. Daly from the Tertiary deposits of the Kettle River, B.C.¹ Measurements of the two cones show that the Alberta specimen is slightly narrower, and that about one-fifth of its length has been removed. The correspondence is so close that the two might well be regarded as the same species, but in the absence of external characters, such a correlation would be unsafe, and it seems desirable to designate the cone by a distinctive name, *P. albertensis*, n. sp.

CUPRESSOXYLON MACROCARPOIDES, PENH.

Specimens 319 and 330 proved to be fairly well preserved woods of *Cupressoxylon macrocarpoides*, with which it was possible to compare them without difficulty.

1. Rept. on Foss. Pl. from the Internat. Bound. Surv. for 1903-05. Trans. R.S.C., VIII, 1907, iv.

This is a species originally described from the Cretaceous of Medicine Hat, Alberta, but which has more recently been found in the Tertiary of Kettle River, near Midway, B.C.² Its present occurrence in the Edmonton Series is, therefore, fully in accord with its previously known distribution.

SEQUOIA ALBERTENSIS, N. SP.

The unnumbered specimen from the Edmonton Series represents a wood which is exceedingly well preserved in many portions, and admits of a detailed diagnosis. It is therefore taken as the type to which specimens 275 and 276 also belong, and they all clearly represent the same species of *Sequoia*. The diagnosis is as follows:—

SEQUOIA ALBERTENSIS, N. SP.

Transverse.—Growth rings variable; the summer wood dense, sometimes rather open and occasionally double, the transition from the spring wood rather abrupt; spring wood open, the tracheids thin-walled, large, distinctly squarish-hexagonal and often much elongated radially. Resin cells scattering, sometimes rather numerous throughout, but especially dominant in the summer wood. Medullary rays *distant 2-8, more rarely 10 rows of tracheids*. Tracheids rather uniform, sometimes in irregular rows in the summer wood.

Radial.—Ray cells straight or more often contracted at the ends, equal to about 4 spring tracheids; the upper and lower walls rather thick, entire or sparingly pitted; the terminal walls rather thin, not pitted; the lateral walls with oval, conspicuously bordered pits, the broadly lenticular orifice usually diagonal to the cell axis, at first 1 or 2, at length becoming 1 per tracheid in the summer wood. Bordered pits large, numerous, round or oval, commonly in two rows in the earlier spring wood. Pits on the tangential walls of the summer tracheids numerous and prominent and large, but rather narrowly lenticular. Resin cells numerous, resinous.

Tangential.—Medullary rays numerous, often upwards of 54 cells high, frequently more or less two-rowed. Cells frequently very resinous, oval or squarish, sometimes oblong, but chiefly uniform and equal throughout.

A comparison of these woods with that of the existing *S. sempervirens*, or red-wood, shows most interesting and very close relations. In the diagnosis of *S. albertensis*, certain of the structural details are given in *italics*. These indicate the respects in which there is an essential difference between it and *S. sempervirens*. In all other features the two woods are

2. *Ibid.*

essentially identical, and one might well be led, at first, to question if they are not, after all, only one form of the same species. But the number of pits which characterize the radial walls of the ray cells, the number of rows of pits on the radial walls of the tracheids, and the size and form of the pits on the tangential walls of the summer tracheids, point with certainty to specific differences, and the fossil is, therefore, described under a new name, for which purpose that of the province seems to be appropriate.

GENERAL CONCLUSIONS.

The character of the material discussed in the foregoing studies, leaves very little room for any conclusions which would be of value in stratigraphical determinations.

The specimen of *Picea* offers only one of a very few examples of the occurrence of cones of this genus in Cretaceous deposits. Berry has recently shown the existence of beautifully preserved cones of *Picea cliffwoodensis* in the Upper Cretaceous of New Jersey.¹ These he regards as comparable with the cones of *P. excelsa*. They, however, offer no points of comparison with *P. albertensis*, inasmuch as they are much larger and more linear-oblong.

As already noted, Penhallow has recorded the sparing occurrence of cones of *P. columbiensis* in the Tertiary of Kettle River, British Columbia. Knowlton has found cones of *P. harriani*² in the Upper Eocene of Kukak Bay, Alaska, a form which is in no sense comparable with *P. albertensis*, though it presents many features strikingly similar to those of *P. cliffwoodensis*.

It may be recalled in this connection, that the foliage of what are at present regarded as distinct species—*P. tranquillensis*, Penh., and *P. quilchensis*, Penh.,³ — has been obtained from the Tertiary of the Tranquille River and from Quilchena, B.C., and there is no present evidence to show that the more recently observed cone from the Cretaceous of Alberta, is not related to one of them, rather than to *P. columbiensis*. If these two were to be regarded as specifically identical, it would be possible to recognize a wider geological range for the species than has heretofore been known; but in the absence of external characters in the Alberta specimen, such a correlation would be unsafe.

Cupressoxylon macrocarpoides, Penh., has been determined on previous occasions, to be common to both the Tertiary and Cretaceous,⁴ and its present occurrence in Cretaceous deposits,

1. The Flora of the Cliffwood Clays, Geol. Surv. N.J., 1905.

2. Fossil Plants from Kukak Bay, Harriman Expd., 1904, iv, 150.

3. Report on the Tertiary Flora of British Columbia, Geol. Surv. Can., Monogr. 1908.

4. N. A. Gymnosperms, Penhallow, 238.

cannot be regarded as having any special stratigraphical significance.

As bearing upon the present studies, it is worthy of note that, in his discussion of the Flora of the Judith River beds, Knowlton records at least three species of *Sequoia*.⁵ Two of these are represented by foliage and small branches only. *S. reichenbachii* (Geinitz) Heer, is known to extend from the Dakota formation to the Belly River Series, in which it is found in Canada. *S. heterophylla* is a well known Cretaceous form of both Europe and America, and in the latter it ranges from the Later Potomac to the Willow Creek Series.

The third species is represented by a cone only, as obtained from the Judith River beds ten miles north of Wild Horse Lake, Alberta. This species, which Knowlton does not distinguish by a specific name, he nevertheless finds to be very near to *S. heerii*, Lesq., although it likewise greatly resembles certain cones of *S. reichenbachii* from the Kome beds of Greenland, as described by Heer. It may be the fruit of the wood now under discussion. It is, however, impossible to correlate these isolated specimens more completely at this time.

From the brief survey of the material thus presented, it is clear that the different species possess no special value for stratigraphical purposes, but they do extend our knowledge of their geological range and geographical distribution in important and interesting ways.

5. Geol. & Pal. Judith River Beds. U. S. Geol. Surv., Bull. 257, 1905, 131-132.

DESCRIPTION OF FIGURES.

SEQUOIA ALBERTENSIS N. SP.

- Fig. 1. Transverse section showing the general character of the structure. x 52.
- Fig. 2. Transverse section showing the double summer wood of the broader growth rings. x 52.
- Fig. 3. Tangential section showing the character of the medullary rays. x 52.
- Fig. 4. Radial section of a medullary ray, showing character and numbers of pits. x 227.5.
- Fig. 5. Radial section showing the two-seriate bordered pits of the spring tracheids. x 227.5.
- Fig. 6. Radial section showing the number and position of bordered pits on the tangential walls of the summer wood.

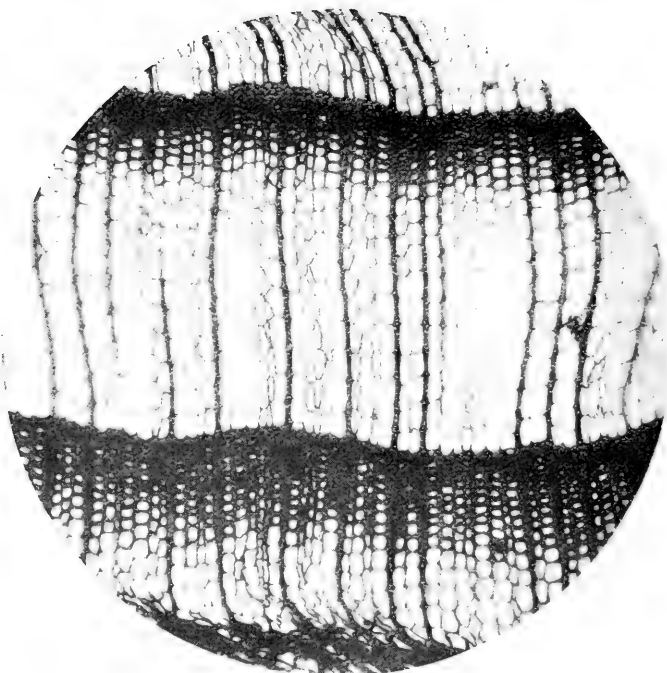


Fig. 1

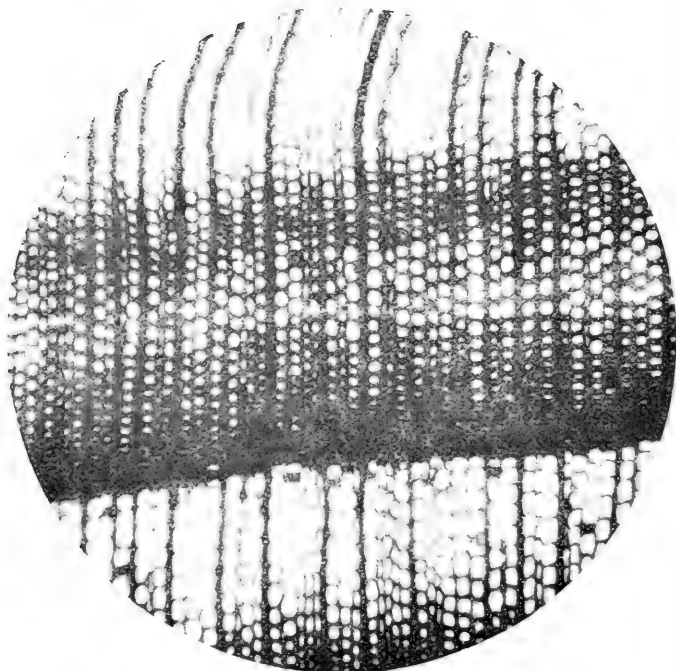


Fig. 2

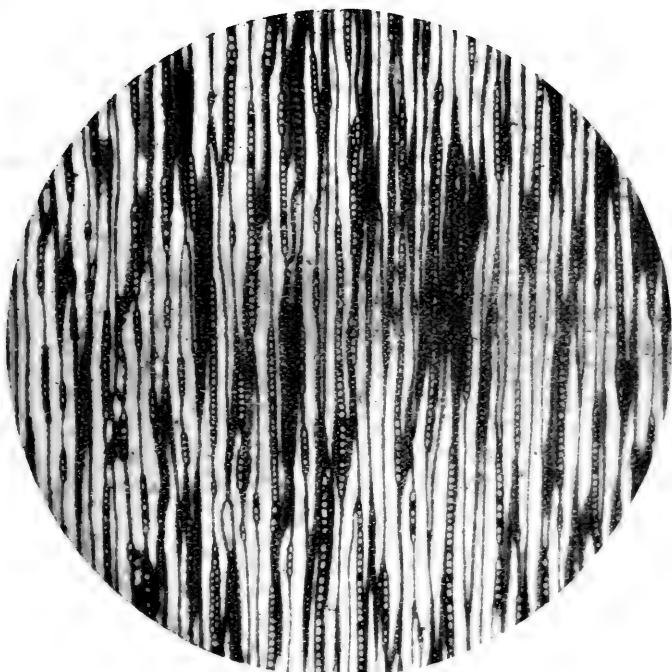


Fig. 3

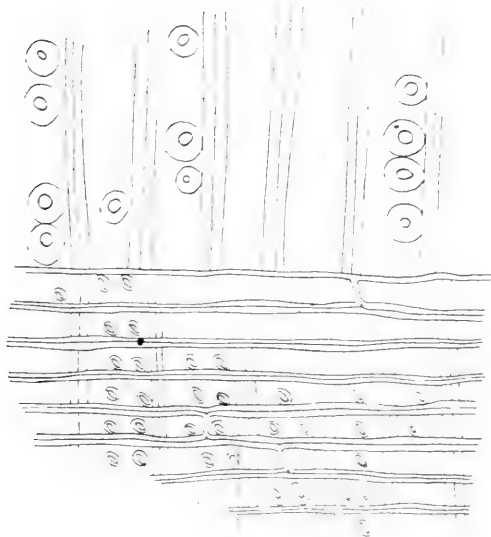


Fig. 4

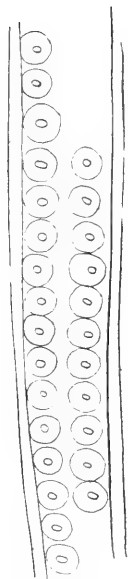


Fig. 5



Fig. 6

NESTING OF COOPER'S HAWK.

A friend, who happened to be spending a few days at Woodlands, Quebec, on the shores of Lake St. Louis, told me he had found an owl's nest with three "white" eggs; but stated he was not quite sure as to identification, because the bird had left the nest while he was some distance away. From his description of the nest and habits of the bird it was very doubtful whether the nest in question was that of any owl, so a special trip was made to the locality on May 21st.

While about 75 yards away a small hawk was observed to fly from the vicinity of the nest. This structure, which was placed about 35 feet up in the top of an evergreen tree, was built of sticks, bark, and a few feathers, and only contained the three eggs, which, on sight, proved to be those of Cooper's Hawk. The eggs are a trifle smaller than those of the Broad Winged Hawk, and are of a light blue color, being somewhat soiled. Incubation was advanced about four or five days.

The bird is not by any means common in these parts, as this is the first authentic record we have of it nesting about the Island of Montreal during the past fifteen years.

W. J. BROWN, Westmount, Que., June 13, 1908.

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No 5.

LYMNÆA UMBILICATA C. B. ADAMS IN CANADA.

BY BRYANT WALKER.

The history of this species has been an unfortunate one. It was originally described in 1840 from specimens collected at New Bedford, Mass. Gould in 1841 (Invert. Mass. p. 218) recognized it as a valid species. But Haldeman in 1842 (Monograph, p. 34) referred it to *L. caperata* Say. In this he was followed by W. G. Binney (L. & F. W. Shells Pt. II, p. 56, 1865) and all subsequent writers with one exception. Dr. Pilsbry in 1891 (Proc. A.N.S.P. 1891, p. 320) stated that *umblicata* was synonymous with *L. cubensis* Pfr., and "perfectly distinct" from both *L. caperata* Say and *L. humilis* Say. That this opinion is correct, I have recently had the opportunity of verifying from an inspection of one of Adams' original specimens now in the Museum of Middlebury College, Vt. (Naut. XXII, p. 7, 1908). The only Canadian citation for this species that I know of, and for this I am indebted to Dr. J. F. Whiteaves, is by D'Urban in 1860 (Can. Nat. VI. p. 97), who quotes it from near the village of Grenville in the County of Ottawa. "D'Urban was more of an entomologist than a conchologist and he expressly states that Dr. Isaac Lea named most of his fresh water gastropods" (Whiteaves). As he does not cite *L. caperata* in his list, in the absence of his actual specimens it is impossible to say whether the identification was correct or not. Dr. Dall in his recent report on Alaskan Mollusks (Harr. Exp. XIII p. 79) includes *umblicata* in the synonymy of *caperata* but expresses "strong doubts as to the validity of this species (*caperata*) which may prove entirely heterogeneous." But he does not attempt to differentiate the two forms. Nor does he state whether the local references cited from the literature refer wholly to *caperata* or not. Apparently no Canadian specimens of either form had been examined by him. In 1880, Mr. G. C. Heron (Trans. Ott. Field-Nat. Club No. 1, p. 39)

published a "List of the Shells found about Ottawa" in which he cited *L. humilis* Say and *L. caperata* Say but not *L. umbilicata*. Shortly after this he sent to me a set of the Ottawa "*humilis*."

In revising my *Lymnæidæ* recently, I found that these shells were not *humilis* but were *umbilicata*. A similar discovery in regard to several lots of "*humilis*" from Maine and its recognition from one locality in Michigan, would indicate a probable range for this form from New England westward to Michigan and northward into the St. Lawrence Valley. Its occurrence in Canada is definitely determined by Mr. Heron's specimens.

In view of the confusion which has existed in regard to these three species *L. umbilicata*, *caperata* and *humilis*, it would seem worth while to call attention to their differences, so that Canadian collectors may more readily distinguish them.

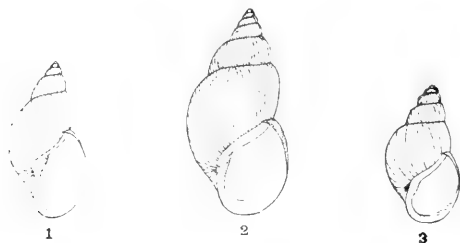


Fig. 1. *L. humilis* Say. Clinton River, Macomb Co., Mich.,
Alt. 10, diam. $5\frac{1}{2}$ mm.

Fig. 2. *L. caperata* Say. Hammond, Ind.
Alt. $12\frac{1}{4}$, diam. 6 mm.

Fig. 3. *L. umbilicata* C. B. Ads. Ottawa, Ontario.
Alt. 9, diam. 5 mm.

As shown by the figures, the three species differ radically in shape and considerably in size. The surface sculpture is also quite different.

Caperata is uniformly larger than the others and is well characterized by the elevated and revolving lines which are very conspicuous in young shells and more or less persistent in maturity and, when present, give the surface a velvety appearance.

Humilis is so different in shape from the others that it seems strange that any confusion should have occurred. It never has the thickened lip so common in both of the other species and its

sculpture of rather fine, but irregular growth lines, with no trace of either raised or incised spiral lines is also characteristic. The specimen figured is the usual northern form which is apparently not typical and barely, if at all, distinguishable from the *L. modicella* of Say.

Umblicata is about the size of *humilis* but in shape is nearer to *caperata*. It is more ventricose than that species and has one less whorl. In full matured specimens, the lip is thickened by a callous deposit, which is more or less tinged with pink. The columella is without a fold and is broadly reflected over the conspicuous umbilicus. The surface is apparently smooth and polished, but under the glass shows usually on the body-whorl some traces of the revolving, incised spiral lines mentioned by Adams and, on the apical whorls, a light, but characteristic longitudinal sculpture.

As stated elsewhere (Naut. 1. c.) *L. umblicata* seems to be a northern variety of *L. cubensis* Pfr. characterised by its more globose shape, more obtuse apex and usually shorter spire and the thickened lip. The additional material that has come under observation since that view was expressed has served to confirm the opinion and therefore, this form should be properly designated as *L. cubensis umblicata* C. B. Ads.

COUNCIL MEETING.

A meeting of the Council of the Ottawa Field-Naturalists' Club was held on June 2nd in the Carnegie Library. The following members were in attendance: The President, Mr. A. E. Attwood; Messrs. A. Halkett, A. Gibson, C. H. Young, J. M. Macoun, E. E. Lemieux, A. McNeil, L. H. Newman and T. E. Clarke; Miss Q. Jackson and Miss E. E. Currie.

The following were elected ordinary members: Dr. E. M. Walker, B.A., M.B., 99 St. George St., Toronto; Mr. T. A. Brown, Normal School, Ottawa; Mr. A. E. Meldrum, Percy St. School, Ottawa; Mr. E. C. Wight, 34 Gilmour St., Ottawa.

Some changes were made in the programme of excursions, and a discussion took place on Dr. White's proposed combined lecture course, in order that the Club's representatives might present the views of the Council at the meeting of the joint committee to be composed of representatives from different societies in Ottawa giving courses of lectures throughout the winter.

T. E. C.

EXCURSIONS.

The sub-excursion of the Club to Beaver Meadow on May 16th. under the direction of Vice-President Halkett, proved a decided success and although the attendance was not as large as might have been expected, this did not affect the enthusiasm of those present. With the object of seeing and learning about nature everyone was keenly on the alert for any natural object from the tiniest insect to the largest fossilized rock.

After a delightful walk through the woods on the banks of the west side of the meadow, the different groups with their leaders assembled on a beautiful piece of turf near the Aylmer Road where short addresses were given about the different objects seen or collected during the afternoon.

Mr. N. Criddle being first called upon, expressed his pleasure at having the opportunity of meeting the members in the field, and in the absence of the leaders of the Ornithological Branch undertook to make a few remarks upon some of the birds observed. Special mention was made of the Baltimore Oriole, White-crowned Sparrow, Rose-breasted Grosbeak, Oven-bird, Cat-bird, Brown Creeper, and Wilson's Thrush.

Mr. T. E. Clark followed and described in general terms the characteristic flora of the places visited, and identified with brief running comments the different species collected.

The plants in full flower were, *Hepatica tribola* and *H. acutiloba*, *Trillium erectum* and *T. grandiflorum*, Dog's-tooth Violet, Bishop's Cap, Wild Ginger, Blue Gohosh, Indian Turnip and a few others. Some plants collected in bud only, were the Smaller Bell-wort, Twisted Stalk, Small Solomon's Seal and Wild Columbine.

Dr. Blackader drew attention to some of the features that made Beaver Meadow the most beautiful locality from a Naturalist's point of view in the Ottawa district. He also gave a practical talk on the typical trees of the locality, many species of which could be seen from the place where the excursionists had assembled.

Across the road in the little cemetery Dr. Blackader pointed out all the local species of elm—the American, or White, the Cork, or Rock, and the Red, or Slippery.

Mr. Lemieux described in an interesting manner the things he had met with and exhibited a little red Salamander. Speaking to the younger people present he advocated the advantage of making notes on the different things discussed, thereby gaining valuable information and interesting reading for the winter months.

Mr. Halkett followed, speaking of the food of the Salamander, caught by Mr. Lemieux, and showed some land shells which it eats. He also spoke of some spiders' capsules, remarking that at the excursion held at Beechwood two weeks previously, such capsules held the eggs of spiders, but that now the young spiders had hatched out. One capsule was found to contain hymenopterous parasites.

Mr. Wilson described how the party under he and Mr. E. Wilson had examined the rocks as exposed along the west side of Beaver Meadow. The party went into a quarry where many interesting geological facts were noted. Attention was called to the dip of the beds which is clearly shown at the quarry, and the use made of the dip and strike in working out the geology of a country was also explained. The quarry is in the lower Trenton and probably near the junction of that formation with the Black River.

The following fossils collected during the afternoon have since been determined by Dr. Ami. *Pachydictya acuta*, *Orthis plicatella*, *Strophomena incurvata*, *Rhynchotrema inæquivalvis* *Asaphus* sp., *Illæmus* sp., several *Monticuliporidae*, *Prasopora Selwyni*, *Batostoma* sp., and other branching forms.

After a few concluding words from Mr. Halkett, the party broke up, all well pleased with their outing.

N. C.

The sub-excursion on the afternoon of Saturday the 23rd of May was held at Ironsides, and those who attended spent an enjoyable time roaming the woods in search of insects and flowers, or in observing the general phenomena of nature, and the geological character of the locality.

The following interesting notes, bearing on the geological features of the district, are by Mr. W. J. Wilson:

"Ironsides is situated on a clay terrace about 182 feet above sea level. Chelsea Station is on a similar terrace or old sea beach and is 365 feet above the same datum, so that in less than three miles there is a rise of 183 feet. Nearly forty years ago this slope was fire swept and the forest completely destroyed; then the soil, bare and unprotected, suffered most severe and rapid denudation. Wherever there were watercourses, however small, deep gullies were cut into the clays and much material was carried to lower levels. In a short time after the fire deciduous trees began to spring up and a fierce battle raged for some years between the forest and the eroding agencies. Gradually the young trees forced their roots deeper into the soil and steadily gained a firm hold till now they have the complete mastery

Erosion has largely stopped, the trees are becoming large and shady, and the decaying leaves and plants are forming humus which is constantly enriching the soil.

Good exposures of Leda clay and Saxicava sand are seen in the railway cuttings, and along the banks of the Gatineau river. Only one exposure of solid rock was noted near Ironsides. This occurs on the west bank of the Gatineau river just below Wright's Bridge, and is a rather fine grained Potsdam sandstone. On account of the clay covering, only a small surface is exposed. The part seen is evidently some distance above the base of the formation which is usually a conglomerate. This sandstone is the same as that used in the construction of the Parliament buildings, and also in the new Victoria Museum. The sandstone used in these buildings came from a quarry on lot 6, Concession II, Nepean Broken Front, where there is a considerable area of this rock. Blocks from the same quarry are used for paving parts of the streets of Ottawa."

At the addresses, which were delivered from a beautiful inclined slope, Dr. E. H. Blackader spoke on the plants, Mr. Norman Criddle on the birds, and Mr. Arthur Gibson on the insects.

The following description of the plants observed or collected is supplied in manuscript by Dr. Blackader, and in effect embodies what he said about them:—

"There is a tiny plant with very beautiful purple coloured flowers which was known to grow in this locality many years ago. It is a plant which has a fairly wide distribution, but yet rather limited to special localities. One may scour all the other localities in the neighborhood of Ottawa, that we are in the habit of visiting in our Saturday afternoon outings, and yet not find this plant. It was feared that it had become exterminated from this locality also, but this afternoon we have found that it is fairly abundant. It belongs to the Milkwort family and is known botanically as *Polygala paucifolia*. The Flowering Wintergreen seems to me to describe it very well in popular language; the other name, Fringed Polygala, is considered more scientifically appropriate.

The Lily family is well represented in this neighborhood. We have found the large Bellwort, *Uvularia grandiflora*, and its poor neighbor, the little pale-coloured Smaller Bellwort, *Oakesia sessilifolia*. Besides these we have seen the Rosy Twisted-Stalk, the Clintonia, the Indian Cucumber-root and several other representatives of this family, some of which are going to seed, and some scarcely opened into flower.

Two specimens of the Orchis family have been gathered: the Showy Orchis and the Early Coral-Root, which is rather inconspicuous and retiring in its habits.

Among the ferns gathered are the Christmas fern which is just opening out its pale green bristly fronds; the Marginal shield-fern; the delicate Beech-fern, and the graceful three-divided Oak-fern.

The Maples are represented by two species which never become trees, and are not seen in the city. They prefer the moist shady hillsides near streams. These are the Moosewood, *Acer pennsylvanicum*, which has a very large leaf for our woods, and drooping greenish racemes; and the Mountain Maple, *A. spicatum*, which has upright racemes while in flower, but they become drooping in fruit."

Following, Mr. Criddle spoke on the birds observed, which included the Black-billed Cuckoo, pointing out that this species is chiefly distinguishable from the Yellow-billed Cuckoo, both of which are found in Eastern Canada, by the colour of the bill, as their names imply; and that both build nests and rear their young, thus differing from the Old World species which lay their eggs in the nests of other birds*; the Ruby-throated Humming-bird; the Phoebe, whose plaintive cry was heard; the Rose-breasted Grosbeak, mentioning that the male bird is of a brilliant black and white with a rose coloured breast, whilst the female is dull coloured and is therefore protected as she sits on her nest unseen by enemies; the Red-eyed Vireo; the Black-and-White Warbler; the Yellow Warbler; the Oven-bird, commenting on

*Whilst it is true, as Mr. Criddle says, that our two species of Cuckoo build nests and rear their young, still there are cases on record where they have followed the habit of their congener, the European Cuckoo, *Cuculus canorus*, and our own Cow-bird, *Molothrus ater*, by laying their eggs in the nests of other birds; such as in those of the robin, cat-bird, mourning-dove, and others. Furthermore, the black-billed cuckoo sometimes lays eggs in the nest of the yellow-billed cuckoo and *vice versa*. There seems indeed to be an erratic trait in the whole group of the cuckoos which number some two hundred species of wide distribution, in the manner of their domestic proclivities. The nests of some are rudely built, whilst others are of slender structure; and a nest may contain at the same time eggs in various stages of incubation and hatched out young ones. Owing to such irregular oviposition, it may not be wondered at that the instinct of the bird might lead her sometimes to drop an egg in the nest of some other bird, as by so doing a purpose may be served to the young bird in being reared in a nest where the depositing of the full complement of eggs is attended by the regularity usual among birds. An interesting instance of the domestic deviations of the cuckoos is that of the Ani, *Crotophaga ani*, a bird of South America and the West Indies. It is said that a number of those birds form a community among themselves and construct a huge nest in which the females in common lay their eggs, which number as many as fourteen or more. Altogether the cuckoos as a group appear to be very erratic and eccentric in their manners of nest-building or non-nest-building, as well as in their habits of depositing their eggs, or in attending to the wants of their young.

its curious mouse-like shaped nest, and mentioning that although this nest is difficult to find yet it was often discovered by the female cow-bird, and used as a means for the rearing of her young at the expense of the rightful tenants; the Redstart; the Wood Thrush, and Wilson's Thrush.

In speaking of the insects, Mr. Gibson mentioned the interest now taken in Mosquitoes owing to the important part they play in the spread of malaria, yellow fever, and other diseases. He spoke of some of the early butterflies, which had been noticed for the first time, namely, the Large Yellow Tiger Swallow-Tail; the Clouded Sulphur; the Northern Dusky-Wing, and the Spring-blue. Bumble-bees, he also said, were particularly abundant, remarking that in the spring of 1907 there were very few specimens on account of the severe open winter of 1906-7, which killed them. Bumble-bees are very valuable insects on account of the good work they do in fertilizing red clover. He showed specimens of the cocoons of the Hickory Halisidota Tussock-Moth. These insects were enormously abundant in August and September of last year, and much anxiety was caused in Eastern Canada by the caterpillars attacking fruit and other trees. Other insects collected during the afternoon were exhibited by Mr. Gibson, and questions were answered in regard to them.

An interesting find of the afternoon was a specimen of the Grass Snake, a species which is not over common in the vicinity of Ottawa.

A. H.

BIRD MIGRATION, 1907.

OBSERVATIONS MADE ON SABLE ISLAND, NOVA SCOTIA.
BY JAMES BOUTELLER.

NAME OF SPECIES.	WHEN FIRST		NUMBER
	SEEN		SEEN
Redpoll.....	Jan.	20.....	One.
Nuthatch.....	"	20.....	"
Saw-whet Owl.....	Feb.	21.....	"
American Robin.....	March	1.....	"
American Crow.....	"	24.....	"
Slate-coloured Junco.....	April	1.....	Several.
White-throated Sparrow.....	"	1.....	"
Canada Goose.....	"	8.....	Two.
American Robins.....	"	11.....	Several.
Belted Kingfisher.....	"	14.....	One.
Fox Sparrow.....	"	14.....	Several.
Terns.....	"	26.....	A few.
Greater Yellowlegs.....	"	28.....	One.

Night-hawk.....	May	1.....	One
Piping Plover.....	"	7.....	"
Crow.....	"	12.....	Three
Swallow.....	"	12.....	One.
Red Phalarope.....	"	13.....	In flocks.
Northern Phalarope.....	"	13.....	One.
Least Bittern.....	"	13.....	"
Roseate Tern.....	"	16.....	"
White Crowned Sparrow.....	"	13.....	"
Pine Warbler.....	"	16.....	"
Least Semipalmated Sandpiper.....	"	19.....	Three.
Curlew.....	June	10.....	One.
Kingbird.....	July	9.....	"
Squa Gulls.....	"	18.....	Several.
White Rumped Sandpiper.....	"	28.....	About 50
Yellowleg.....	"	30.....	One.
Black-bellied Plover.....	Aug.	12.....	Two.
Rail.....	"	14.....	One.
Pectoral Sandpiper.....	Sept.	7.....	"
Connecticut Warbler.....	"	15.....	"
American Pipit.....	"	18.....	About 2 dz.
Canada Goose.....	"	18.....	About 1 dz.
American Osprey.....	"	26.....	One.
White Throated Sparrow.....	"	26.....	"
Mourning Dove.....	"	26.....	"
Black Throated Blue Warbler.....	"	28.....	"
Black and White Warbler.....	"	28.....	"
Bronze Grackle.....	"	29.....	Two.
Yellow Palm Warbler.....	Oct.	3.....	In numbers
House Sparrow.....	"	6.....	One.
Fox Sparrow.....	"	15.....	Two.
House Wren.....	"	17.....	One.
Slate Coloured Junco.....	"	17.....	"
Golden Crested Wren.....	"	18.....	Two.
Red Throated Loon.....	"	19.....	One.
Vesper Sparrow.....	"	21.....	"
American Robin.....	"	24.....	In numbrs.
White Throated Sparrow.....	"	24.....	In numbrs.
Hermit Thrush.....	"	24.....	A few.
Yellow-billed Cuckoo.....	"	26.....	One.
American Bittern.....	"	27.....	"
Snow Bunting.....	"	27.....	In numbrs.
Hermit Thrush.....	Nov.	1.....	Several.
Nuthatch.....	"	1.....	Several.
Scaup Duck.....	"	1.....	Several.
Long-tailed Duck.....	"	1.....	About 50.
Northern Shrike.....	"	16.....	One.

ENTOMOLOGICAL NOTES FROM CENTRAL NEW
BRUNSWICK.

BY WM. H. MOORE, SCOTCH LAKE, N.B.

The following notes were jotted down during the seasons of 1901 and 1907.

April 4th, a species of *Grapta*, probably *faunus*, was observed on the house.

April 11th, two *Vanessa antiopa*, one *V. milbertii*.

April 12th, *Grapta j.-album*: Graptas were common.

April 18th, one *V. milbertii*. Very few examples of this species are seen here.

May 6th, *Lycæna marginata*, common by 9th.

May 14th, *Pieris napi*, rather rare here now.

May 21st, *Thecla augustus*; very scarce here.

May 23rd, *Papilio turnus*; last seen July 19th.

May 24th, *P. asterias*. Full grown larvæ were found on carraway July 12th. Very small larvæ were noticed on carrots July 26th. A full grown larva taken July 26th was sluggish the next day and pupated on 28th. The chrysalis was a beautiful shade of light green with the protuberances on the back yellow. On August 8th the colour was decidedly darker and before noon a male butterfly emerged.

August 6th, a caterpillar of *P. asterias* was found hung up in a crevice of a barn; the following day it had changed to a chrysalis, which was much darker in colour than the first one mentioned.

Many imagoes of *P. asterias* were seen from August 4th to 8th, changing to chrysalis form. A period of thirteen days elapsed from full grown larva to imago; but some individuals winter in the chrysalis stage. A female when laying her eggs hovers over a leaf and with curved abdomen places the egg upon the under side of the leaf.

May 26th, *Pieris napi* and *P. rapæ* and *Papilio turnus* seen.

June 4th, *Thanaos icelus*.

June 5th, *Brenthis myrina* first seen. *P. turnus* and *Pieris rapæ* very plentiful.

June 11th, *Lycæna lucia*, *Phyciodes tharos*, *Eudamus pylades* and *Thorybes hobomok*.

June 15th, *Chrysophanus hypophlæas*, *Basilarchia disippus*.

June 13th, *Anosia plexippus* taken on choke-cherry bloom, another seen the next day. One secured August 8th was newly hatched. August 16th, a chrysalis of this species was found

hanging in grass near some milkweeds. August 28th, a full-grown larva was secured.

June 16th, *Basilarchia arthemis* first seen, became plentiful but by July 16th was about over. On September 10th, a remarkably late date, the last one of the season was seen.

June 26th, *Argynnis atlantis*, abundant.

June 27th, *Pyrameis cardui*, a very rare butterfly here. *Phyciodes marcia*, *Thanaos icelus*, *Eudamus pylades*, and *Colias interior*, and some unidentified skippers are noticed.

July 10th, *Satyrodes canthus* and *Satyrus alope* are added to the list.

July 18th, a very rare species is added, it being *Thecla acadica*. Only two examples of this species have been seen here before.

August 7th, *Feniseca tarquinius*, first found, but in May and June, 1907, they were abundant.

August 22nd, *Basilarchia hultii* was taken. This is the only example of this species ever seen here. It differs from *disippus* in having white spots on the hind wings.

Two specimens of *Debis portlandia* have been caught in this section. *Grapta progne* and *G. gracilis* have also been taken. *Melitæa harrisii* was secured July 16th, 1907.

July 24th, 1906, while watching skaters on a brook, one was observed to leap upon a small green bug commonly known as a spit grass-hopper or frog-hopper. The bug was drawn beneath the body of the skater, which evidently began to suck its juices. The current was carrying the skater down stream so it began moving toward a tuft of grass, upon a blade of which it obtained a resting place. In the meantime other skaters had scented the bug and were circling about the captor evidently in search of some slight repast. A couple of weeks later Mrs. Moore was near the brook at this same place and heard a buzzing among some grass and brush. Investigation proved the sound to be produced by a very large dragon-fly that was engaged in mortal combat with a large hornet. The hornet was frightened away from its antagonist yet it did not go far away, and within a minute returned to the fray. All the while the dragon-fly kept up its buzzing, evidently to frighten its enemy. The hornet was not to be cowed by a noise, and again attacked the dragon-fly, worrying it from the under side, apparently trying to cut off its legs. It had succeeded in amputating one leg when the fight was stopped and the dragon-fly secured as it was of a species not in our collection. Had the hornet succeeded in its endeavors it would have been master of the situation, as it is with its legs the dragon-fly embraces its prey, while it bites it.

While taking a half-mile walk, one Sunday afternoon in August, along a road bordered with alders, and leading through a swamp, numbers of reddish dragon-flies were seen. Two pairs were secured, the males were cardinal, with chocolate coloured heads and black side markings upon each segment of the body. The females had greenish faces. One was light-brown with blackish markings, while the other was red and black, yet not so bright red as the males. When caught both females voided eggs which were transparent, round, and of a yellowish shade.

Several species of damsel and dragon-flies are found along the afore-mentioned brook and road. They are coloured in different shades of grey, blue, green, yellow, red, white and black.

BOTANICAL BRANCH.

On the evening of May 7th, a regular meeting of the Botanical Branch was held at the home of Mr. Geo. H. Clark, Seed Commissioner, Ottawa. There was a large attendance and a most interesting discussion took place upon the following topics:—

(1) Process of making water colour drawings—by Norman Criddle.

(2) Group and family characteristics of seeds and their import in the identification of plants—by W. Bond, Seed Branch, Ottawa.

(3) Conditions unfavorable to the resumption of growth by the dormant embryo—by G. H. Clark, B.S.A., Seed Commissioner, Ottawa.

Mr. Norman Criddle, Aweme, Man., who has done such excellent work in preparing the illustrations for the book on "Farm Weeds" recently published by the Seed Branch of the Department of Agriculture, outlined his methods of procedure in the production of his paintings. Mr. Criddle explained that whatever measure of success he had enjoyed was due to the early encouragement he had received. This explanation, however, was not considered sufficient in itself to account for the marked ability shown by the artist. It was discovered later that Mr. Criddle showed special talents in this direction when a mere child. The ability to reproduce exactly what one sees in the minutest detail, is a rare gift and one possessed by Mr. Criddle to a high degree.

Mr. Bond, Assistant in the Seed Laboratory, described the methods followed by the Seed Branch in identifying weed seeds. The speaker explained the difficulty that was met

with owing to the absence of any definite method of classification similar to that relied upon when the flower is available for identification purposes. While this fact necessitated the use of a large reference collection of correctly named seeds taken from authentic samples, yet many families of plants were found to produce seeds of a certain type common to the family to which they belong and which were therefore easily placed in the proper family. As instances of this, the characteristics of the seeds of the following families were submitted:—

RANUNCULACEAE. (Crowfoot Family).

Genera having achenes. Achenes flat, irregularly oval in shape with pointed base. Persistent style of varying length, attached.

PAPAVERACEAE. (Poppy Family).

Seeds kidney shaped with raised reticulated surfaces. Seeds of several genera crested.

CRUCIFERAE. (Mustard Family).

Seeds generally with depression along each side of the radicle causing it to project prominently. Hilum white. Acrid taste. Pericarp often finely pitted.

CARYOPHYLLACEAE. (Pink Family).

Seeds kidney shaped with characteristic tubercles or warts generally arranged in parallel rows or concentric rings.

MALVACEAE. (Mallow Family).

Seeds kidney shaped, resting sides flattened or compressed.

LEGUMINOSAE. (Pulse Family).

Seeds with hard pericarp. In many genera the radicle projects prominently; others are globular with a long characteristic hilum.

UMBELLIFERAE. (Parsley Family).

Carpels usually with five prominent ribs, ventral surface flattened. Many produce aromatic odour from essential oil.

COMPOSITAE. (Composite Family).

Achenes oblong and stick-like, often having ribs running longitudinally. When the pappus is detached a conspicuous crown or impression remains.

LABIATAE. (Mint Family).

Achenes mostly attached at the base, leaving characteristic depressions. Many genera show two flattened sides through pressure in ovary. Somewhat resemble small insects.

PLANTAGINACEAE. (Plantain Family).

Seeds boat-shaped with rounded ends. Dorsal surface convex, ventral showing a deep groove with an oblong spot resembling an eye.

POLYGONACEAE. (Buckwheat Family).

Achenes usually sharply triangular, an occasional genus

lenticular with pointed end. Generally highly glazed.

GRAMINEAE. (Grass Family).

Grain or caryopsis has small embryo placed at the base of the grain. Wheat grain is typical of the grain of many genera with palets removed. Some genera have highly glazed palets closely adhering to the caryopsis.

From the above it will be seen that the seeds of some families at least have certain characters peculiar to them which aid materially in their identification.

The identification of the species is a much more difficult matter and generally speaking requires long experience in order to become at all proficient in this connection. In the species of the genus *Brassica* for instance, it was pointed out that it is necessary to plant the seed of doubtful samples and produce the first foliage leaves at least in order to be sure of their identity. Within recent years that part of the study of botany which has to do with the seed has been largely overlooked although a most interesting field of work is offered in this connection.

Mr. G. H. Clark next presented the following paper:—

CONDITIONS UNFAVORABLE TO THE RESUMPTION OF GROWTH
BY THE DORMANT EMBRYO IN SEEDS.

True germination in seed producing plants takes place when the oospore germinates after fertilization within the ovule has been secured, which process of fertilization produces the oospore. The succeeding generation then commences in the development of the embryo, which, when ready to separate itself from the mother plant, is surrounded by, attached to, or contains within its cells a supply of nutriment necessary to its further growth. The seed is then said to be ripe, and the embryo plant may then be said to be ready to enter upon a period of rest. It is well known that with many kinds of seeds a rest period is enforced, which may be taken as one of nature's methods of providing for the perpetration of the species. Experiments conducted in the seed laboratory with many kinds of cultivated plants and with weed seeds make clear that this preservation of life, or delayed germination, varies considerably, even with fully ripened seeds taken from the same plant.

Conditions that are unfavorable to germination.

(a). Maturity of embryo. Although the seed may be said to be ripe when it has naturally separated itself from the mother plant, the embryo is not necessarily fully matured in the apparently ripe seed until such time as it may be able to commence with the process of secreting enzymes, which are necessary to the digestion of the food stored by it for the purpose of its nutri-

ment when growth is resumed. It is stated or suggested by some botanists of repute that this so-called non-maturity of the embryo in sound and apparently ripe seeds is the cause of delayed germination of most seeds that seem to require a rest period. Some recent work by Crocker, however, would seem to disprove this theory with many, but not all, kinds of seeds. The hawthorn, for instance, will germinate very sparingly during the first two years, even though ideal conditions for growth be provided, by artificial or other means.

(b). Water content. The ideal condition for preserving life and vital energy within the embryo of most seeds is storage in a relatively cool, dry place. Even under the best conditions of storage, seeds gradually part with their moisture content. The rapidity with which this takes place is believed to be due largely to the condition of the seed coat. If the seed coat be such as to hermetically seal the embryo with its food supply, then life is preserved, under proper conditions of storage, for a longer period.

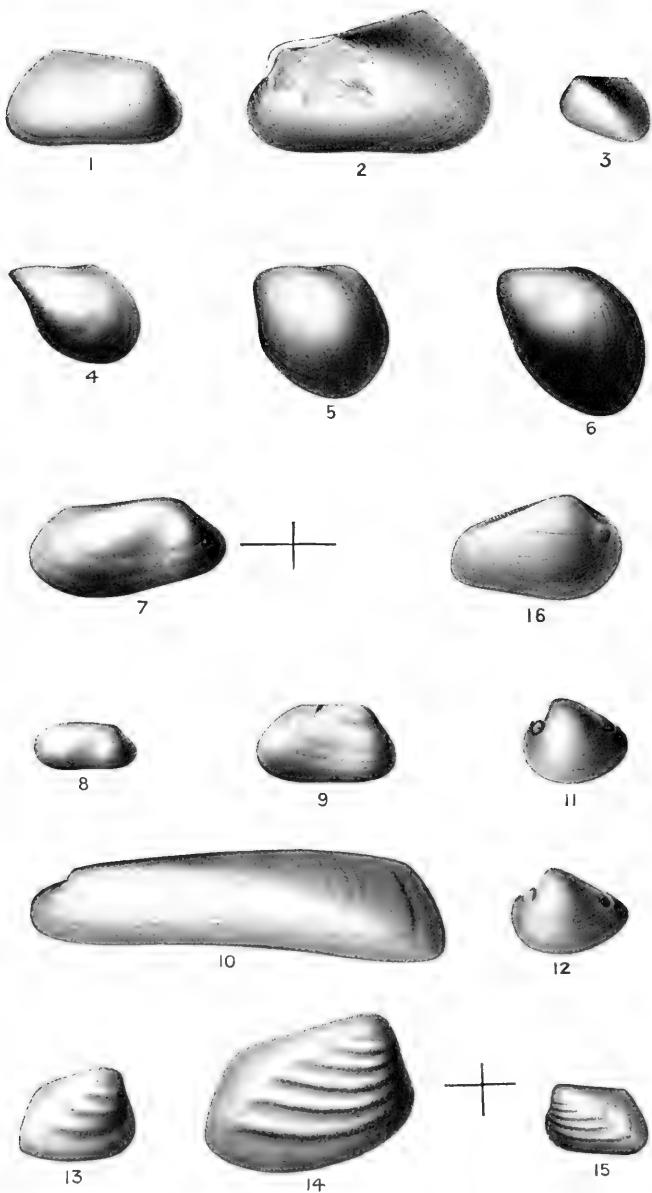
Germination of the seed or resumption of growth on the part of the embryo can not take place unless the embryo is able to secure a sufficient supply of water, even though the embryo may be fully matured and ready to commence growth. Crocker found that in most kinds of seeds, such as are to be found among the cruciferae, borraginaceae, the plantains, the iris, and many species of water plants, that the embryo and its store of food was so completely sealed in a seed coat, impervious to water, that germination could not take place. He conducted extensive experiments with seeds of various kinds of plants by germinating them at different temperatures, with some of which seeds he artificially striated, or clipped the seed-coat, in a way not to injure the embryo, and compared the germination with seeds of the same kind on which the seed coat remained intact. With very few exceptions he found that the artificial clipping of freshly-ripened seeds (by which process of clipping he enabled the water to reach the embryo) induced prompt growth, whereas those with seed coats not clipped failed to germinate or germinated very sparingly; further, that the various kinds of seeds differ in respect to the temperature best suited to the re-sumption of rapid growth on the part of the embryo. It was found that with some of the seeds that were not entirely impervious to water but in which inhibition took place slowly, that the embryo swelled and filled the cavity occupied by it, and yet growth did not commence. As soon, however, as the "plug", or that small portion of the seed coat of some species of seeds (iris) which is contiguous to the embryo, was removed, artificial growth at once commenced. Crocker's work entirely

bears out the result of tests conducted in our seed laboratory with fresh seeds of cucurbits, radish and other cruciferous seeds and such kinds as are known to have a relatively hard seed coat, as clover seeds and others. Samples of red clover and alsike seeds that are sent in for test in the fall of the year, directly after they are harvested, are expected as a rule to give a low percentage of germination and a high percentage of seeds that remain sound and hard. Ordinary storage for a period of six months apparently breaks down the natural condition of the seedcoat of clover seeds which renders them difficultly pervious to water. One sample of red clover seed, produced in the province of Manitoba, when submitted to the usual germination test, showed only 17% of growth during the first month and less than 50% at the end of three months. From the original sample 50 grains were taken and artificially clipped (without injuring the embryo,) in order to secure the admission of water. From these 50 seeds made pervious to water by artificial means, 50 plants were promptly produced, when submitted to the ordinary methods of germination.

The question of how this difficulty may be overcome with commercial seeds has apparently occupied the attention of expert seedsmen and brewers. It is well known that these freshly ripened seeds are entirely satisfactory in respect to their germination after they have had a rest period of six months or a year. Radish seeds, for instance, are known to be more satisfactory, from the seedsman's standpoint, when they are fully one year old. It is known that some skilled seedsmen are able, within a few hours, by treating their supplies of cruciferous seeds (and other seeds which, when fresh, show delayed germination) to secure as satisfactory results as by keeping them over in storage for a year; and it is believed to be a quite common practice on the part of some seedsmen to kiln dry their fresh stocks of such seeds for a few hours, at a temperature that is not dangerous to their vitality. That is done also by brewers with some lots of barley of mixed varieties, for the purpose of reducing the barley to a uniform rapidity of germination."

L. H. N.

Mr. Norman Criddle, who has been in Ottawa for the last three months, left on the 5th August for his home at Aweme, Man. Mr. Criddle has been a member of the Club for many years, and during his stay he attended most of the spring excursions and did much to make them a success.



CHAZY PELECYPODA

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NOTES ON THE PELECYPODA OR BIVALVE MOLLUSCA OF THE CHAZY FORMATION IN CANADA, WITH DESCRIPTIONS OF ONE NEW GENUS AND FOUR NEW SPECIES FROM THE CHAZY SANDSTONE AT THE HOG'S BACK, NEAR OTTAWA.

By J. F. WHITEAVES.

All bivalve mollusca, whether fossil or recent, such as clams, mussels, oysters, and the like, belong to a class for which various names have been proposed by systematists. Among these names some of the best known are *Διθυρα*, Aristotle; *Bivalvia*, Linnæus (1767); *Acephala*, Cuvier (1798); *Lamellibranchiata*, Blainville (1816); *Conchifera*, Lamarck (1818), and *Pelecypoda*, Goldfuss (1821). For many years the name *Lamellibranchiata* has been in use for this class, but *Pelecypoda* is the one now preferred for it by some of the latest authorities, on account of its uniformity with other molluscan class names, such as *Gasteropoda*, *Scaphopoda*, and *Cephalopoda*.

The pelecypoda of the Chazy formation in Canada have not been studied at all exhaustively, and not many of the species that occur therein have been either determined or described.

In the late Mr. E. Billings' excellent paper on the "Fossils of the Chazy Limestone," which was published in the "Canadian Naturalist and Geologist" for December, 1859, about two pages are devoted to the consideration of the pelecypoda of that formation, under the name lamellibranchiata. Fossils belonging to this class, Mr. Billings writes, are "rare in the Chazy limestone, yet the species appear to be somewhat numerous. I think I can make out 17 species belonging to *Ctenodonta*, *Cyrtodonta*, *Vanuxemia*, *Modiolopsis*, and probably two or three other genera. As the specimens consist mostly of casts, they

must remain undescribed until better can be procured." He then proceeds to identify some specimens from the Canadian Chazy with *Ctenodonta nasuta* (Hall), and to describe three new species, under the names *Modiolopsis parviuscula*, *Cyrtodonta breviuscula*, and *Vanuxemia Montrealensis*, but figures only the latter. In regard to these four species the following notes are submitted.

Ctenodonta nasuta (Hall).

Mr. Billings says that this species "occurs in the Chazy sandstone at Lac Aurau River above the River Rouge, and also at the Mingan Islands in the Chazy limestone." The writer has not seen any specimens of it from the first of these localities, which should read—at Lac Oureau River, above the Riviere Rouge, in Joliette Co. In the Museum of the Geological Survey there are two casts of the interior of the shell of specimens, labelled "*Ctenodonta nasuta*. (Hall, sp.), Mingan Islands, Logan and Richardson, 1856." These are probably the specimens referred to on page 134 of the "Geology of Canada" (1863), which are said to be from the "bay above Clear Water Point," which is on the north shore of the Gulf of St. Lawrence, opposite the Mingan Islands.

Modiolopsis parviuscula, Billings (Pl. III, figs. 1 and 2).

This species is very inadequately defined, and it has not previously been figured. All that is said of it by Mr. Billings is that it "closely resembles *M. modiolaris* (Conrad); but is always less than half the size of that species. It occurs in the Chazy limestone at Montreal, near Cornwall, at the Mingan Islands, on the Islands at Lake Huron, and also at Punk Island, Lake Winnipeg." The only authentically named specimens of *M. parviuscula* that the writer has seen are a single right valve from Cornwall (fig. 1), collected by Mr. Billings; and four badly preserved casts of the interior of single valves from Punk Island, collected by Professor H. Youle Hind in 1858 (one of which is represented by fig. 2). All of these are in the Museum of the Geological Survey.

In regard to the comparative size of *M. modiolaris* and *M. parviuscula*, the following measurements may be of interest. The maximum length of the largest and most perfect Canadian specimen of *M. modiolaris* in the Museum of the Geological Survey is 68 mm. (or nearly $2\frac{3}{4}$ inches); and that of another, in the same museum, is $61\frac{1}{2}$ mm. (or

nearly $2\frac{1}{2}$ inches). The greatest length of the right valve of *M. parviuscula* from Cornwall (fig. 1) is 24 mm. (or a little less than an inch); and that of one of the largest valves of a specimen of the same species from Punk Island (fig. 2) is about 33 mm. (or an inch and a quarter).

M. parviuscula is rather an inappropriate name for the species for which it was proposed, as it is by no means the smallest of the genus. In the Museum of the Survey there are two specimens of *M. jaba* (Conrad, 1842), from the Black River limestone at Paquettes Rapids, that are only 4 and 5 mm., respectively, in their maximum length.

Cyrtodonta breviuscula, Billings (Pl. III, fig. 3).

The type and only known specimen of this species, in the Museum of the Geological Survey of Canada, is the left valve figured on Plate III. It is said to have been collected by Mr. Billings from the "Chazy sandstone three miles east of the city of Ottawa, half a mile back from the river."

Vanuxemia Montrealensis, Billings.

The types of this species, from the "Chazy limestone on the Island of Montreal and near L'Orignal," were collected by Sir W. E. Logan and Dr. R. Bell. In regard to this species Mr. Billings writes, "I have placed it in the genus *Vanuxemia* provisionally, but it may be necessary hereafter to remove it to some other genus." Ulrich places *Vanuxemia* in his family *Cyrtodontidae*, but it has long seemed to the writer that *V. Montrealensis*, with its thin test and compressed mytiloid form, is rather referable to the *Ambonychiidae*. In 1903, Dr. H. M. Ami made an interesting collection of fossils from the Chazy limestone at Van Horne Avenue, Montreal. Among these fossils there are twenty-five or more that appear to be referable to *V. Montrealensis*, though most of them are only imperfect and badly preserved casts of the interior of single valves. If these specimens are correctly identified with *V. Montrealensis*, then, in the writer's judgment, that species must belong to Ulrich's genus *Clionychia*, there being, apparently, no byssal opening as in *Psilonychia*.

In an Appendix to Dr. R. W. Ells' Report on the Geology and Natural Resources of the Area included in the Map of the City of Ottawa and vicinity, published in 1889, in the Annual Report, New Series, Vol. XII, of the Geological Survey of Canada, Dr. H. M. Ami records the occurrence of *Vanuxemia*

Montrealensis, Billings, in the Black River formation at the Hog's Back; and of *Ctenodonta* (it should be *Cyrtodonta*) *breviuscula*, Billings; *Ctenodonta*, sp.; and *Modiolopsis parviuscula* Billings; in the Chazy formation at the Hog's Back.

Lastly, in a paper on the "Fauna of the Chazy limestone," published in the American Journal of Science for November, 1905, Mr. Percy E. Raymond describes 13 species of pelecypoda from the Chazy of the State of New York, and Canada. Three of these are from the neighbourhood of Ottawa, viz., *Ctenodonta parvidens*, from the Hog's Back; and *Whitella Canadensis*, and *Modiolopsis Sowteri*, from Aylmer. The types of these three species are in the Yale University Museum at New Haven, Connecticut. For the opportunity of examining these types and those of *Clionychia marginalis*, *Ambonychia* (?) *curvata*, and *Modiolopsis fabæformis*, the writer is indebted to Mr. Raymond.

The pelecypoda that are described or referred to on the following pages, were collected by Mr. Walter R. Billings from the Chazy sandstone and shale on the east side of the rapids at the Hog's Back, in the township of Gloucester and county of Carleton, principally in the years 1906 and 1907. They are all mere casts of the interior of the shell, which rarely show any clear indications of the hinge dentition, or well defined imprints of the muscular scars.

From the sandstone which, Mr. Billings says, immediately underlies the Birds eye limestone at this locality, there appear to be about eight species of pelecypoda in the collection, though two of them are too imperfect for identification or description. These pelecypoda are associated with *Lingula Lyelli*, Billings, a *Holopea*, and casts of the interior of the shell of a species of *Spyroceras*.

From the immediately underlying shale there are, in the collection, specimens of *Ctenodonta parvidens*, Raymond, that show imprints of some of the hinge teeth, and several casts that may also be referable to that species, but which show no traces of such imprints. These are associated with *Lingula Belli*, Billings.

The species of pelecypoda in this interesting collection may be provisionally described or determined as follows:—

A. *From the Chazy sandstone at the Hog's Back.*

CLIONYCHIA OTTAWAENSIS, sp. nov.

Plate III, fig. 4.

Shell, as indicated by casts of the interior of single valves, small, strongly convex in the median region longitudinally; narrowly, obliquely and acuminate subovate, or mytiloid.

in its marginal outline, with nearly straight, prolonged and terminal umbones; and about one-third longer than high.

Ventral margin gently convex behind the umbones; hinge line straight and moderately elongated, forming an obtusely subangular junction with the posterior margin, which is somewhat obliquely subtruncate above and narrowly rounded below; umbones rather attenuate; beaks small, depressed, incurved.

Test unknown; surface of casts marked with concentric lines of growth. Hinge dentition and muscular impressions unknown.

Represented in the collection by eight casts of the interior of single valves.

A much smaller and more convex species than *C. marginalis*, Raymond, and with more strongly curved beaks.

CLIONYCHIA (?) GIBBOSA, sp. nov.

Plate III, figs. 5 and 6.

Left valve, the only part of the shell known, tumid, strongly convex and gibbous on the umbonal declivity, but flattened obliquely on the anterior side; marginal outline varying from rounded subpentagonal in one specimen (fig. 5) to obliquely subovate in another (fig. 6).

Anterior margin truncated almost vertically above, and curving abruptly and convexly backward into the narrow and somewhat pointed base below (as in fig. 5); or narrowing rather rapidly and uninterruptedly both inward and downward from the umbo to the base (as in fig. 6). Posterior margin either subtruncated rather obliquely, and nearly parallel with the anterior margin above, and rounding into the base below (as in fig. 5); or broadly convex (as in fig. 6); hinge line straight and moderately elongated; umbo broad, obtuse and terminal; its under or inner surface flattened.

Test unknown; surface of the cast apparently concentrically striated. Hinge dentition and muscular impressions unknown.

Represented in the collection by two imperfect and badly preserved casts of the interior of two left valves. The outline of the posterior margin of fig. 6 is a little restored. A peculiar species, whose characters are as yet but very imperfectly indicated.

MODIOLOPSIS FABÆFORMIS, Raymond.

Plate III, figs. 7, 8 and 9.

Modiolopsis fabæformis, Raymond. 1905. Amer. Journ. Sci., Fourth Series, Vol. XX, p. 374.

A few specimens that are probably referable to this species, though the dorsal margin of each is not quite so high posteriorly as is that of a typical specimen of *M. fabæformis*, a right valve from Valcour Island, kindly lent to the writer by Mr. Raymond. Three of the best of these specimens from the Hog's Back are figured on Plate III. They may be described as follows:—

Shell very small, rather strongly convex, most prominent and tumid on the posterior umbonal slopes, with a faint, wide, shallow and oblique depression in front of them; maximum thickness through the closed valves nearly as great as their maximum height; valves elongated, twice as long as high and very inequilateral.

Anterior portion of the valves short, narrowly rounded at its extremity below; posterior portion thereof much longer and a little higher and deeper than the anterior, its extremity either obliquely subtruncate above and apparently bluntly pointed below, as in figs. 7 and 9, or evenly rounded, as in fig. 8. Ventral margin very shallowly, and in some cases (fig. 7) rather obliquely concave anteriorly, and gently and broadly convex behind. Superior border descending rapidly and obliquely in front of the beaks, nearly straight and horizontal behind them; valves highest and deepest at the posterior termination of the hinge line, in consequence of the slight convexity of the ventral margin posteriorly; umbones low, obtuse; beaks small, depressed, incurved, and placed at a short distance from the anterior end.

Test unknown; surface of the cast marked with a few concentric lines of growth. Hinge dentition and muscular impressions unknown,

The original of figure 7, on Plate III, is a cast of the interior of both valves. The specimen represented by figure 8, on the same plate, is a cast of the interior of a right valve, with a somewhat straighter ventral margin, and more regularly rounded posterior extremity. In its size and marginal contour this specimen closely resembles the Trenton fossil figured by Hall as a "large and characteristic form" of *Modiolopsis faba* (Conrad) on Plate 35, fig. 6 a, of the first volume of the Palæontology of the State of New York. The cast of the interior of a right valve represented by fig. 9 on Plate III, is rather like

Modiolopsis Nais, Billings, from the Black River limestone at Paquettes Rapids, but is flatter and distinctly though shallowly depressed in front of the posterior umbonal slope. It looks as if it had been abnormally compressed.

The type specimen of *M. fabæformis* is in Mr. Raymond's collection.

ORTHODESMA ANTIQUUM, sp. nov.

Plate III, fig. 10.

Shell somewhat compressed, most convex and prominent on the posterior umbonal slope of each valve; slender, elongated, and nearly four times as long as high.

Anterior portion of the valves very short and narrowly rounded; posterior portion of the same more than five times as long as the anterior, a little higher and deeper behind the midlength than in front of it; superior border or dorsal margin increasing slowly in height posteriorly, nearly straight, but slightly convex; its inferior border or ventral margin also nearly straight, but faintly concave; posterior extremity rather obliquely subtruncated, and apparently forming a subangular and somewhat pointed junction with the ventral margin. Beaks small, inconspicuous and appressed, placed at a short distance from the anterior end.

Test unknown; surface of casts marked with concentric lines of growth. In one specimen these growth lines are rather numerous and closely disposed. Hinge dentition unknown; muscular impressions indistinctly defined.

Five badly preserved and for the most part very imperfect casts of the interior of single valves.

This species occurs also in the Chazy sandstone at Aylmer, where specimens have been quite recently collected by Mr. T. W. E. Sowter, associated with *Whitella Canadensis*. It is provisionally referred to *Orthodesma* on account of its resemblance, in marginal outline, to certain well known species, such as *O. rectum*, Hall and Whitfield, and *O. subnasutum* (Meek and Worthen). If it is an *Orthodesma*, it is the oldest known species of that genus.

VANUXEMIA PARVULA, sp. nov.

Plate III, figs. 11 and 12.

Shell small for the genus, valves moderately convex, broadly subovate, or ovately subtrigonal, and very little longer than high.

Anterior portion of each valve short, and comparatively broadly rounded; posterior moiety of the same longer, moderately produced, narrowing rapidly both above and below, and bluntly pointed at its extremity; ventral margin forming a longitudinally semiovate curve; superior border descending rapidly in front of the beaks, and rather more gradually so behind them; umbones broad and prominent; beaks incurved and placed at a short distance from the anterior end.

Test unknown; surface of casts of the interior smooth. Hinge dentition also unknown. Anterior muscular scar deeply impressed and concentrically striated; posterior scar indistinctly defined, apparently narrowly subovate and acutely pointed above.

Three casts of the interior of single valves, two of which are figured, and one cast of the two valves united.

SOWTERIA, gen. nov.

Shell rather small, equivalve, moderately convex, sometimes tumid and always most prominent on the oblique posterior umbonal slope; subtrapezoidal in marginal outline, a little longer than high, and very inequilateral. Posterior area defined by an abrupt inflection of each valve at and behind the subangular umbonal declivity.

Test unknown; in casts of the interior the greater part of the surface is marked by a few large concentric rib-like folds, but the posterior area of both valves is nearly or quite smooth. Hinge dentition and muscular impressions unknown.

Type and only known species of the genus, *Whitella Canadensis*, Raymond.

All the specimens of *W. Canadensis* that have yet been collected show only the general shape of the shell and its coarser surface markings. These, however, are so peculiar as to be readily distinctive. The reference of these shells to the genus *Whitella* can scarcely be regarded as satisfactory, and the writer would prefer to regard them as more probably indicative of a new generic type, whose precise affinities have yet to be ascertained, and for which the name *Sowteria* is here provisionally suggested.

SOWTERIA CANADENSIS (Raymond).

Plate III, figs. 13, 14 and 15.

Whitella canadensis, Raymond. 1905. Amer. Journ. Sci., Fourth Series, Vol. XX, p. 373.

The cotypes of this species are casts of the interior of two detached left valves from the Chazy sandstone at Aylmer, Que.,

collected by Mr. Sowter, and now in the museum of Yale University. At this locality numerous casts of right and left valves have been collected by Dr. H. M. Ami and by Mr. Sowter.

In Mr. Billings' collection of fossils from the Hog's Back there are eleven casts of the interior of single valves of *S. Canadensis*. Most of these are imperfect and badly preserved, the three specimens figured on Plate III being the most perfect but by no means the largest. In figure 14 on that plate the ventral margin is a little restored. The generic definition of *Sowteria* is largely based upon these three figured specimens, and the following description of some of their presumably specific characters may be added. Anterior portion of each valve very short, in some specimens truncated almost vertically at its extremity, in others faintly concave under the beaks above, and rounded at or below the midheight; posterior portion moderately elongated, its extremity obliquely subtruncate above and narrowly rounded below. Superior border and ventral margin nearly straight or very gently convex; beaks nearly or quite terminal.

In a right valve of *S. Canadensis* from Aylmer, collected by Dr. Ami in 1893, there is an oblique, shallow, median depression.

B. *From the Chazy shale at the Hog's Back.*

CTENODONTA PARVIDENS, Raymond.

Plate III, fig. 16.

Ctenodonta parvidens, Raymond. 1905. Amer. Journ. Sci., Fourth Series, Vol. XX, p. 372.

The cotypes of this species are two specimens from the Chazy shale at the Hog's Back, collected by Mr. Sowter and now in the museum of Yale University. Both of these specimens show impressions of the hinge teeth.

C. parvidens appears to be the most abundant and characteristic fossil of the Chazy shale at this locality, where specimens have been collected by Dr. Ami and Mr. Sowter, as well as by Mr. Billings. Dr. Ami has also found numerous specimens of it in the Chazy shale at Rockland, on the Ottawa River, twenty-one miles below Ottawa, in the township of Clarence.

In Mr. Billings' collection from the Hog's Back there are nine casts of the interior, either of separate valves or of the two valves united, all of which show impressions of at least some of the hinge teeth. The following is an original description

of these specimens, in which the shorter, higher and deeper portion of each valve is regarded as anterior, and the prolonged portion as posterior.

Shell compressed convex, about one-third longer than high, narrowly subovate and very inequilateral.

Anterior (?) portion of each valve short, its margin shallowly concave above the midheight, convexly curved and narrowing rapidly inward to the base below; posterior (?) portion much longer than the anterior, decreasing gradually both in height and depth, its extremity obliquely subtruncate above and narrowly rounded below. Ventral margin convexly curved anteriorly, almost straight but slightly concave behind. Cardinal border descending very gradually behind the beaks and much more rapidly so in front of them; umbones broad and more or less flattened; beaks appressed, incurved, with a forward (?) inclination, placed considerably in advance of the midlength.

Surface marked with numerous, fine, close-set, concentric raised lines, or minute narrow ridges. Impressions of the hinge teeth minute and very indistinctly defined in all the specimens that the writer has seen. On the shorter and presumably anterior portion of the hinge line there appear to be about four of these impressions; and on the longer and presumably posterior portion, about twice as many.

Associated with these specimens there are quite a number of badly preserved casts of the interior of the closed valves of a shell which may be referable to this species, but which show no impressions of any of the hinge teeth. These casts have much the same marginal outline as the typical *C. parvidens*, but in some of the former the valves seem to be proportionately more convex, the umbones farther apart, and the beaks more curved.

EXPLANATION OF PLATE III.

(The originals of all the figures on this plate are mere casts of the interior of the shell, and the whole of the figures, except figs. 7 and 14, are of the natural size. The originals of figs. 4-15, both inclusive, are from the Chazy sandstone at the Hog's Back).

MODIOLOPSIS PARVIUSCULA (page 106).

Fig. 1. A right valve of this species, from Cornwall, Ontario.

Fig. 2. A left valve, from Punk Island, Lake Winnipeg.

CYRTODONTA BREVIUSCULA (page 107).

Fig. 3. The type of this species, a left valve, from three miles east of Ottawa.

CLIONYCHIA OTTAWAENSIS (page 108).

Fig. 4. An unusually perfect left valve of this species.

CLIONYCHIA GIBBOSA (page 109).

Fig. 5. The "rounded subpentagonal" left valve referred to on page 109.

Fig. 6. The imperfect and "obliquely subovate" left valve referred to on the same page.

MODIOLOPSIS FABÆFORMIS (page 110).

Fig. 7. Enlarged side view of the left valve of the specimen with both valves, referred to on page 110. The cross lines to the right show the exact length and height of the shell.

Fig. 8. The right valve referred to on page 110.

Fig. 9. The right valve also referred to on page 110 which is probably referable to this species.

ORTHODESMA ANTIQUUM (page 111).

Fig. 10. The type of this species, a nearly perfect but not very well preserved left valve.

VANUXEMIA PARVULA (page 111).

Fig. 11. Side view of a left valve of this species.

Fig. 12. Another and very similar left valve.

SOWTERIA CANADENSIS (page 112).

Fig. 13. A right valve of this species, of about the average size.

Fig. 14. A small right valve, slightly restored at the base, and enlarged. The cross lines to the right show the exact length and height of the specimen.

Fig. 15. A left valve of this species.

CTENODONTA PARVIDENS (page 113).

Fig. 16. An abnormally compressed and presumably right valve of this species, from the Chazy shale at the Hog's Back

NESTING OF HENSLOW SPARROW IN ONTARIO.

BY W. E. SAUNDERS, LONDON, ONT.

Henslow Sparrow is one of the rarest breeding sparrows in Western Ontario and its nest and eggs are rare in collections and always desirable. Prior to this year a nest had not been found in Canada, although it was known that the birds were reasonably common about fifteen miles west of Chatham in some fields near the mouth of the Thames River.

On June 17th, 1908, Mr. L. B. Brown and I went to this region for the express purpose of endeavoring to find the nest of this rare bird. We found the birds there in considerable numbers and were delighted by taking a nest and five eggs on the evening of our arrival. The next day we started out with high hopes, but after a whole day's fruitless search we came to the conclusion that we were too early, as we saw more

pairs of birds than one would expect if the breeding season were in progress. We also found one pair in the act of building.

The nest which we found was prepared exactly as stated by Mr. Peabody in the Auk, namely, in long grass partly fallen over, not placed on the ground, but three or four inches above it, supported mostly by dead grass. This differs widely from published reports, some of which are quoted below.

The nest was built of grass exclusively, the inner being, of course, finer. The five eggs which it contained varied in size from .69 x .5 to .7 x .54 and are strikingly different from eggs of the Savanna and Song Sparrow type, resembling rather some sets of Field Sparrow but larger. The ground colour is pure white and the spots a very light reddish-brown in a rather heavy wreath near the large end. The rest of the egg is almost unmarked.

The bird flushed from the nest when we were about five feet on each side of her, and the nest was found without difficulty, but, in other parts of the large field where the birds were, we would probably have had trouble in finding one even if the bird had been flushed as the grasses were so heavily matted.

The field contained perhaps 75 acres and had grown up to wild grass entirely. A small part only had been ploughed in some earlier year, but had not been harrowed, and the rest was apparently in its original condition. I should judge that the grass would grow to a height of three feet and the birds nest, as stated, in the matted dry grass of the previous year's growth. Most of the field was burnt off since last summer, and consequently our search was confined to the comparatively small portion which the fire had left untouched. The ground is only slightly raised above the Lake level and has doubtless become dry since the construction of a ditch and dyke nearby.

In Baird, Brewer and Ridgway's "Birds of North America," it is stated that the nest is placed "on the ground in a depression or apparently an excavation scratched out by the bird itself. The nest is a well made structure."

Davies' "Nests and Eggs of North American Birds," states that the nest is placed on the ground, sometimes in a slight depression, beneath a tussock made of grasses and a few cow hairs.

In the Nidologist, Vol. 1, p. 180, L. W. Watkins describes the taking of a nest similar to ours, about 4 inches above the ground in a tuft of grass.

From these notes it will be seen that the position of the nest is variable.

The Short-billed Marsh Wren inhabits similar ground to Henslow Sparrow, although I have never as yet found them

together, but in the course of the careful search to which we subjected this old grass, Mr. Brown found a nest of the Wren which I think is worthy of description. When one locates a pair of Short-bills he immediately begins to find nests in the tall waving grasses, covered on the outside with green grass. These nests are, in my experience, invariably empty, but now it appears that nearby there is probably a different nest with eggs. The one found by Mr. Brown was set low down so that it was very inconspicuous and instead of being built of green grasses, as are the false nests, it was constructed of last year's growth in the same manner as that of the Long-bill.

In this nest were the remains of a set of five eggs, two badly broken and three which made moderately good cabinet specimens. The nest had been deserted for probably a week or two.

A REMARKABLE VISITATION OF THE SNOW-WHITE EUGONIA, *ENNOMOS SUBSIGNARIUS*, HBN.

BY ARTHUR GIBSON, CENTRAL EXPERIMENTAL FARM, OTTAWA.

On the evening of July 23rd, last, Ottawa was visited by enormous numbers of the Snow-white Eugonia, the caterpillars of which are known as the Elm Span worm. Thousands of the moths appeared in all parts of the city, being attracted to the arc lights. Around many of these electric lights hundreds of specimens were flying and resting on any available place. Some of the electric light poles were literally covered with them, and from a short distance the poles looked as if they had been whitewashed or given a coat of white paint. On the main streets, such as Sparks and Bank, the moths were much noticed and caused considerable comment. Stores which had their doors opened were invaded by the insects, much to the annoyance and discomfort of the people inside. The many brilliant lights at Britannia also attracted great numbers of the moths.



SNOW-WHITE EUGONIA.

The Snow-white Eugonia, although a common insect and widespread in distribution, has not, as far as we know, ever been noticed in such numbers, in Canada, as it was on the above evening. The following evening, July 24th, a few specimens were seen fluttering about, such as might be noticed during any season when the insect is in its normal numbers.

The figure herewith gives a good idea of the size and appearance of the moth. As its name implies, it is pure white, expanding about an inch and a half when the wings are spread.

In the United States, the caterpillar of this moth has, on many occasions, appeared in very destructive numbers, and, on account of its injuries to the elm and being one of the measuring-worms, it has been called the Elm Span-worm. Its injuries to shade trees, particularly elm and basswood, in some of the larger cities, have been specially reported upon by several observers. It is also recorded as an apple tree pest.

The female moth, soon after emerging from the pupa, lays a large number of eggs, usually on the underside of the branches of the trees. The eggs remain on the limbs until the following spring, only hatching, it is stated, when the leaves unfold, the young caterpillars feeding on the new and tender foliage. In from five to six weeks from hatching the caterpillar has reached its full growth, and in colour resembles the twigs of the tree on which it has been feeding, the body being brownish; the large head and terminal segment of the body are bright red. When mature the larva changes to the chrysalis state, and in about 10 days the moth emerges.

The sudden great abundance of this insect on the above evening was certainly remarkable and very extraordinary. Not a single specimen of the larva was seen in the Ottawa district during June or July by any of the officers of the Division of Entomology, or by other local entomologists, and it would be most interesting to know where all the moths came from.

The sparrows of the city had a great feast early the following day. Along the main streets, the wings of the moths were very noticeable, the bodies having been eaten.

In an article on the White-marked Tussock Moth, Dr. E. P. Felt, in his "Insects Affecting Park and Woodland Trees," says: "Dr. J. L. Le Conte has placed on record an interesting instance of the effect this bird may have on our local fauna. He states that the English sparrow was imported for the purpose of keeping in check the Snow-white Linden Moth, *Ennomos subsignarius*, Hbn., and that in Philadelphia, after the sparrows had destroyed the *Ennomos* larvæ, the White-marked Tussock Moth caterpillars found abundant food, and being unmolested by the sparrow, on account of their irritating hairs, they soon became even worse pests than the other species."

Since the above article was prepared, similar visitations, in New York State, of apparently the same moth, have been reported in the daily press and certain agricultural papers.—Ed.

GENERAL EXCURSION TO CHELSEA.

The first General Excursion of the year was held on May 30th, to Chelsea, the most favourite resort of all. Nearly 200 members and friends attended the outing. President Attwood was in charge and he had with him an unusually large number of Leaders. After enjoying the afternoon in roaming the woods, in search of specimens, or making observations on natural objects, the whole party met again in the grove at 5 o'clock, and listened to interesting talks by many of the prominent members of the Club.

Dr. H. M. Ami, who was one of the first Leaders called upon, in speaking of the geology of Chelsea said, in part: "We are standing on ground which is the meeting place of the two extremes in the geological scale. This locality is situated where the earliest rock-formations that we know of, constituting the earth's crust, are in close contact with the most recently deposited in the last phase of the history of this part of our continent. The former consists of highly metamorphosed and hard crystalline rocks, making up part of the original crust of the earth; the latter, of comparatively soft sands, gravels, clays and boulder clays, constituting the soil and land surfaces generally, which are tilled by the agriculturist of to-day. The former holds minerals of great economic value:—mica, felspar, iron ores, marbles, asbestos, graphite, molybdenite, and other materials used in the arts and manufactures, not to speak of rocks, such as granite, gneiss, dolomite, etc. The older rocks are ascribed to the Laurentian and Huronian systems in geology, whilst the more recent ones are referred to the Pleistocene or Post-Tertiary (sometimes called the Quarternary) system. Chelsea Station stands on the edge of a terrace, or old sea beach, estimated at 365 feet above present tide level (the datum point) on the St. Lawrence at Three Rivers. Salt water shells, well known as living or recent species in the salt waters of the Gulf and River St. Lawrence below the Island of Orleans, were obtained in a gravel pit a few hundred yards north of Chelsea Station and are exhibited as evidence of the marine origin of the sands and clays from which they were obtained. Scratched pebbles (glaciated) of the district, revealed the presence of a sheet, or mantle of 'till,' laid down by the Labradorian glacier. It was a land ice-mass, possibly two or three thousand feet in thickness at the maximum period of refrigeration of this part of the continent and no organic remains have been detected in the Labrador formation which constitutes the lowest of the three series forming the Pleistocene system as developed at this locality."

Specimens, illustrating the geology of Chelsea and the vicinity, were exhibited, including some of the minerals named above.

In calling upon the botanists, Mr. Attwood mentioned that there were present the three authors of the now famous book, "Farm Weeds of Canada," namely, Dr. Fletcher, Mr. Norman Criddle, and Mr. G. H. Clark.

Dr. Fletcher spoke about some of the rarer plants found during the afternoon, particularly the orchids. He showed specimens of *Orchis spectabilis*, *Habenaria Hookeri*, and *Cypripedium acaule*. He deprecated the digging up of the roots of this last which could not be cultivated like the other species. Through this useless destruction the plant was now very rare here.

Mr. Criddle spoke briefly of his work as illustrator of the book on Farm Weeds, and emphasized the necessity of careful observation for exact reproduction.

Mr. G. H. Clark described the methods by which the book referred to had been distributed to approved schools under the supervision of the inspectors, to be used as a reference work for the school section. He also referred to a proposed work by the Department of Agriculture on Fodder Plants.

Mr. W. T. Macoun gave a practical demonstration of the means of distinguishing the evergreens found at Chelsea. He also pointed out the conditions accounting for the remarkably large numbers of maple and beech seedlings observed during the afternoon.

Mr. Power, of the Normal School, spoke appreciatively of the benefits derived by the Normal School students from the outings of the Club. He exhibited an interesting series of beech seedlings in various stages of development, and drew attention to a number of the interesting plants collected.

Mr. Halkett and Prof. Prince spoke on some zoological specimens which they had collected during the afternoon, and Mr. Caesar, of the Wellington Field-Naturalists' Club, of Guelph, Ont., stated his pleasure at being able to attend the excursion and meet the members.

T. E. C.

SUB-EXCURSION TO CACHE BAY, TETREAUVILLE, QUE.

On June 13th the above interesting locality was visited by about 25 members and friends of the Club. The afternoon was particularly pleasant in the woods, and an enjoyable and profitable time was spent by those who attended the outing. Mosquitoes were rather abundant and very aggressive in their attacks. Cache Bay is a rather good locality for *Cypripedium*

pubescens, but we were too late to see this attractive plant in bloom. One or two faded specimens were noted. Fifteen different species of birds were seen, the most interesting of which was the Pine Warbler, a rather rare bird everywhere, and one which is always found in pine woods. One nest each of the Spotted Sand-piper and of the Song Sparrow was found. A great many different kinds of insects were noticed and some interesting specimens were captured. A nice specimen of the butterfly, *Phyciodes batesii*, was taken; a rare insect at Ottawa which is probably its furthest eastern station. A single specimen of *Ephialtes gigas* was captured; this large ichneumon-fly is also uncommon in the Ottawa district. The foliage of elm, basswood and wild cherry was seen to be badly disfigured by the small pocket galls caused by species of mites belonging to the genus *Eriophyes*. One or two nice specimens of the small reddish salamander which occurs at Ottawa were found, as well as some spiders, millipedes, land shells, etc., all of which were exhibited at the close of the outing, when short addresses were given by Messrs. Attwood, Gibson, Eifrig, Wilson, McGillivray, Shannon, Lemieux and Halkett.

A. G.

GENERAL EXCURSION TO CARLSBAD SPRINGS.

On June 20th, the second General Excursion was held to the Mer Bleue, Carlsbad Springs. The day was a perfect one in many ways, but unfortunately a very strong wind was blowing which made it difficult to study birds, or to collect insects. The Mer Bleue is one of the most interesting hunting grounds for the naturalist in the district, and it is to be regretted that there was such a poor attendance of members at the excursion. Those who did attend were delighted with what they saw or collected during the day. The early part of the morning was spent in the bog, but on account of the strong wind, the party soon divided, only a few remaining in the swamp, the others returning and going into the woods nearby. The beautiful rosy-pink flowers of the pale Sheep Laurel, *Kalmia glauca*, were everywhere to be seen in the bog, with here and there clumps of the Cotton Grass. The rare orchid, *Arethusa bulbosa*, was found in numbers, and outside of the swamp, nearby, two fine specimens of the even rarer orchid, the large Purple-Fringed orchis, *Habenaria fimbriata*, were found by Mr. Criddle and the writer. A single worn specimen of the rare butterfly, *Argynnis tricularis*, was taken in the Mer Bleue by Mr. Young. On June 9th three fine examples of this insect were captured in the bog, one by Mr. Criddle, one by Mr. Young, and the other by the

writer. It is some years since this butterfly has been taken in the Ottawa district. Dr. Fletcher has collected it once or twice previously at the Mer Bleue, which is probably the most southern locality known for this insect. All the specimens which have been taken here have the markings slightly suffused on both the upper and lower surfaces.

In a wood near the Mer Bleue, Mr. Lemieux found a fine specimen of the Spotted Salamander, *Amblystoma punctatum*, and also some specimens of *Plethodon erythronotus* and *Plethodon erythronotus cinereus*. These latter salamanders occur commonly in the Ottawa district.

The small, curious caterpillars of the plume moth, *Pterophorus eupatorii*, were found in numbers feeding on the leaves of Joe Pye Weed, *Eupatorium purpureum*, and in some pasture fields the Hard-hack, *Spiraea tomentosa*, was seen to be badly infested by the galls of a cecidomyid. Many of these plants were entirely covered by these galls. Since, the small fly has been reared and specimens have been determined by Dr. E. P. Felt, of Albany, N.Y., as *Rhabdophaga salicifolia*, a species which has been found abundant in Massachusetts and New York, on the above plant and also on *Spiraea salicifolia*.

A. G.

MEETINGS OF THE ENTOMOLOGICAL BRANCH.

Meeting held at the residence of Mr. Harrington, 13th February, 1908. Present, Messrs. Fletcher, Letourneau, Halkett, Nelles, Gibson, Young, Baldwin, and Mr. Harrington, in the Chair.

Mr. Letourneau showed a perfect nest of *Eumenes globulosus*, with the insect which had emerged from it during the past summer. The specimen had been found on the twig of a bush on the Experimental Farm.

Dr. Fletcher showed a fresh supply of *Boreus californicus* which had just come to hand in a living state from Mr. J. W. Cockle, of Kaslo, B.C. He also spoke of some most interesting observations by Mr. Cockle upon the mating of these insects. Specimens apparently of another species had been collected by Mr. N. B. Sanson, in the Rocky Mountain Park, Banff, Alta. Other interesting specimens shown were: a specimen of the remarkable Snow fly, *Chionea valga*, taken at Banff by Mr. Sanson; the strange heteropterous bug, *Emesa longipes*, which was one of five specimens taken by Mr. W. A. Dent, at Sarnia, Ont.; some living larvæ of the Brown-tail Moth in their winter web, also a fine series showing inflates of the full grown larvæ and the perfect moths. Collections of insects made by Mr. D.

H. Nelles in Bartlett Bay, off Glacier Bay, Alaska, and by Mr. W. J. Wilson on the Hudson Bay Slope, were exhibited and examined with much interest by those present. Dr. Fletcher also exhibited the first number of the new *Journal of Economic Entomology*, and a photograph of Prof. Aldrich, the author of the Catalogue of North American Diptera.

Mr. Halkett showed a series of larvæ, pupæ, and the male and female beetles, of *Dytiscus circumcinctus*, which he had taken in the Qu'Appelle Valley and also in Cooking Lake, Alta. This species is sometimes remarkably abundant at electric lights in some of the western prairie cities. Mr. T. N. Willing, at Regina, and Mr. J. D. Evans, in Winnipeg, saw early in October enormous numbers of these beetles flying around the street lights. Mr. Halkett's larvæ and pupæ were collected in the beginning of August and the perfect insects were flying in the beginning of October. Mr. Harrington exhibited his fine collection of Dytiscidæ containing many named types which had been examined by Mr. John D. Sherman, of New York.

Mr. Nelles showed some beautiful photographs which had been taken during his expedition of the past two years on the Alaska Boundary Survey. These were examined with great interest by all present.

Mr. Baldwin showed a handsome case of insects, the two most interesting of which were a fine specimen of *Eubaphe læta* taken at Graham's Bush, Britannia, on July 7th, and a nice specimen of *Anarta cordigera* taken on June 2nd.

Mr. Gibson showed specimens of food stuffs infested by the Grain Weevil, *Calandra granaria*, also pease infested by the Pea Weevil, *Bruchus pisorum*, and beans by the Bean Weevil, *Bruchus obtectus*. He drew attention to the different methods of attack and gave a sketch of the life-history of the two species. The seeds of Indian corn destroyed by *Ptinus fur* were shown and it was stated that this was an unusual attack. Some galls of the Prickly Raspberry gall made by *Diastrophus nebulosus* were shown together with the gall maker.

Mr. Young showed specimens of beetles of unusual occurrence at Ottawa which he had taken during the past season. Among these were *Dicalus teter*, *Ditylus caeruleus*, *Phyxelis rigidus* and *Lixus concavus*. Of the last of these he had collected three or four specimens upon a plant of *Polygonum pennsylvanicum*. Dr. Fletcher stated that this beetle was sometimes injurious to rhubarb, the larvæ boring in the stems and occasionally doing a considerable amount of harm. The *Polygonum* belongs to the same natural order as the rhubarb.

Mr. Harrington showed several of his beautifully arranged

cabinet drawers, among others his collection of Japanese insects which contained some specimens of remarkable beauty. He described the habits of a large wasp, *Vespa mandarina*, and spoke of his visit to Japan some years ago, giving a most interesting sketch of the history of the capture of some of the specimens shown in the cases.

J. F.

Meeting held on Thursday evening, 12th March, at the residence of Mr. Andrew Halkett, besides whom there were present, Dr. Fletcher and Messrs. Harrington, Gibson, Young, Baldwin, Metcalfe, Letourneau and Newman.

Mr. Baldwin showed a box containing living larvæ in the cocoons and a few moths of the Wax Moth, *Galleria cerealella*; also a miscellaneous collection of moths captured at Ottawa.

Mr. Gibson exhibited a box containing moths of the genus *Homoptera*, among which was a specimen of a new species to be described soon by Dr. J. B. Smith as *H. helata*. This was taken by Mr. Baldwin, and is the first record of the moth from the Ottawa district. In the same box also was a specimen of the butterfly, *Pamphila palamon*, taken at Carlsbad Springs.

Mr. Metcalfe showed specimens of two small moths showing secondary sexual characters, and a water Hemipteron.

Mr. Harrington exhibited, among other specimens, a series of cocoons of various insects and spiders, and caddis-fly larva cases; also a series of Buprestian beetles of the genus *Chalcophora* from different lands.

Mr. Letourneau produced a box containing a number of different kinds of caterpillars nicely inflated. Among these were several specimens of the Silver-spotted Skipper, the Zebra caterpillar, the Hedgehog caterpillar and the Fall webworm.

Dr. Fletcher showed two enormous galls from California, with a few specimens of the makers, *Andricus californicus*, and read some interesting paragraphs from Miss Evelyn Groesbeeck Mitchell's recent work entitled: "Mosquito Life." Dr. Fletcher spoke in the highest terms of this work and of the convenient arrangement of the facts for reference.

Mr. Young exhibited two artistic cases of Lepidoptera, one illustrating the life history of the Spotted Halisidota, *Halisidota maculata*, the larvæ being on their food plant, the willow; and the other case, specimens of the larvæ and imagoes of the Milk-weed Moth, *Euchaetias egle*, on their food plant, the milk-weed.

The recently issued Annual Report of the Entomological Society of Ontario was laid on the table. Dr. Fletcher drew attention to some of the more interesting local captures which had been recorded in the Entomological Record.

A. H.

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INFANT CANNIBALISM AMONG ANIMALS.

BY PROFESSOR EDWARD E. PRINCE, DOMINION COMMISSIONER
OF FISHERIES, OTTAWA.

In a paper which I read to the Royal Society (Sect. IV) in May last I dealt with the two series of phenomena grouped under the somewhat forbidding titles, polyembryony and pædophagy. They may be regarded as the two opposite extremes of embryonic evolution and the survival of the fittest. In the former (polyembryony) we find that a few eggs give origin to an excessive number of young, while, in the latter, very few young result from a large number of eggs. Biologists have generally accepted the late Dr. W. B. Carpenter's definition of an individual animal as the total product of a single ovum, but our ideas of the potentialities of the egg will require revision with the foregoing phenomena before us, and in my Royal Society paper I ventured on some suggestions as to the significance of recent observations, very curious ones, made by certain biologists, Dr. Gilchrist, Dr. Sylvestri, Marchal, and others, which I intend to publish with plates ere long, but in the present brief article I shall deal only with pædophagy, avoiding technical terms as far as possible.

Fifty years ago Dr. Carpenter, one of the profoundest and most philosophical physiologists and morphologists of the 19th century, discovered that, from the numerous eggs (500 or 600 at least being produced by one parent each season), of that common sea-shore mollusk, the dog whelk (*Purpura lapillus*), not more than thirteen to twenty embryos finally emerged into the open water. To quote the succinct description of Carl Claus, "The Prosobranchs enclose their ova in capsules attached to each other or to foreign substances. Each nidamental capsule of the group shows an aperture, and contains a certain number of vitelline globes or eggs, floating in clear jelly-like albumen. Only a portion of these develop into embryos. One only may,

in an extreme case, finally quit the ovigerous capsule."* Koren and Danielsson in 1857 studied the eggs of the large whelk (*Buccinum*) and decided that many eggs united to form one large embryo, the remaining eggs dying and breaking up; but, immediately after the publication of the Danish observers' views, Dr. Carpenter gave the correct account of the strange phenomenon, an account supported by the later researches of Dr. Dyster. Part of the eggs are fertilized and part are not fertilized but are devoured by the former while still contained in the capsule. Long before the infant mollusks become active "veligers," or free-swimming larvæ, with a crown of waving cilia, they turn cannibal. Dr. Carpenter noticed that some larvæ did not devour their fellows; but depended for nutriment upon their own stock of yolk-macromeres. These became stunted, and many died. The macromeres, it is hardly necessary to say, are the large segments at one side of the egg, as distinguished from the micromeres at the other side, the latter forming the germ. Selenka confirmed Dr. Carpenter's results but held that the cleavage of the early unfertilized egg was not true segmentation, and inferred that, while the minute features of the yolk, in both kinds of eggs, appeared to be the same, there was no nucleus discoverable in the unfertilized eggs. In the Gastropod *Tergipes ansea* he found that when this irregular segmentation took place, portions of the yolk were thrown off, developed cilia, and became independent moving "cosmellæ," as Von Nordmann called them, and they have been regarded as parasitic in nature. Edouard Clapareda, again, from his study of *Neritina fluviatilis* was able to further confirm Carpenter, and Blochmann discovered, in the same small fresh-water shellfish, that one embryo only may survive out of 70 or 80 contained originally in one capsule. Dr. W. K. Brooks announced, more recently, that in the egg-case of *Urosalpinx*, containing six to twenty ova, many of them are devoured by the others both in the earlier and the later stages of embryonic development. Professor J. P. McMurrich, of Toronto, has confirmed these last results by a study of *Crepidula* and *Purpura floridana*, finding that a number of eggs always break down or disintegrate to serve as food for their surviving brethren. In *Fasciolaria tulipa*, one of the Muricidæ, he noted that four, or five, or six, embryos may ultimately emerge from one nidamental capsule, which originally contains about two hundred eggs. But not only in

*Haacke has stated that in certain Australian Rays (*Tryogorhina* and *Rhinobatis*) more than one ovum is contained in one horny capsule, and Dr. Otto Klotz, of Ottawa, brought the same fact to my attention in the huge British Columbia skate (*Raja cooperi*, Gir.)

mollusks has this curious fact of pædophagy long been known it has been noticed among the Crustacea. Thus in *Daphnia*, the delicate water-flea, while the eggs are still in the tubular ovary, the ovigerous cell may divide into four, one of which becomes an ovum and increases in size by devouring the other three. In the Phyllopod *Apus*, the egg when first distinguishable, is not a single cell, but a group of four cells each with a large nucleus. The nucleus in one assumes a different character, becomes clearer, and more rotund, exhibiting two or more large granules or germinal spots, while the three others show a mass of granules in the nucleus. These three nuclei grow rapidly, elaborate food, and feed the fourth cell so that it survives, while they themselves disintegrate. No doubt this strange phenomenon of cannibalism, in the earliest stages of development, may be more widespread than is at present supposed. Botanists have long been familiar with a parallel condition in certain plants. Thus, in the Mistletoe (*Viscum album*), one seed may contain two or three embryo plants. Some years ago Dr. Beard, of Edinburgh, boldly compared the embryo of the highest Vertebrates to a parasite receiving nutriment by a placental arrangement from its parent. About the same time Professor McIntosh, of St. Andrews, published an account of the remarkable features of the ovary in *Zoarces viviparus*, the viviparous blenny, the ovarian walls being complexly folded and richly vascular so that the young fish inside are bathed in a nutritive serum until far advanced in larval life. In making sections of the ovary, and contained young, of that species over a quarter of a century ago, I found what appeared to me to be particles of yolk in the alimentary canal which I had difficulty in tracing to the so-called absorption or inclusion of the yolk-sac. Dr. Scharff, of the Royal Museum, Dublin, was at the same time making a study of the early egg in *Zoarces* and other fishes, and the number of eggs present in the ovary of the viviparous blenny struck me as remarkable if only 12 or 15 young were ultimately produced. Could it be that in some way the non-developing eggs served as food to nourish the rapidly growing larvæ emerging from a limited number of ova? The question presented itself to me. It appeared possible but hardly probable.

Dr. Gilchrist, a distinguished Scottish biologist, and officially in charge of the fisheries of Cape Colony for some years, has shown that such a surmise was not far astray. He has proved it to be true in the South African *Catoloxus messieri*. Günther, a fish 1 to 2 feet long, and occurring apparently at considerable depths ranging from 400 to 700 fathoms. H.M.S. "Challenger," in her famous scientific cruise, secured a male

specimen 8 inches long in Messier Straits, but Dr. Gilchrist's specimen 2 feet long obtained in September, 1903, about 40 miles north-east of Cape Point, proved to be a mature female specimen in which the ovaries were very advanced and crowded with reddish spherical eggs, numbering probably not less than 30,000.*

The eggs were formed in the hanging transverse folds of the inner ovarian surface, and later they collected on the floor of the chamber of the ovary. They flowed freely from the fish, and Dr. Gilchrist was led to regard them, at first, as ordinary demersal eggs, deposited by the fish on the bottom of the sea. To his surprise he found, on closer examination, very young fish hatching out within the parent. Eight small larval fish were curled up among the loose ova. In the mouth of one larva he found some oil-globules, and in another a mass of soft food-matter, in which were oil-globules and spots of black colour. The mass was carefully removed and turned out to be part of a young fish which was being devoured by another baby fish, and the rest of the body of the victim was found close to its devourer. Alcock had already made the important announcement that in *Saccogaster*, a deep-sea species, developing embryo fish were found inside the parent and hinted that they fed on the surrounding ova; but Dr. Gilchrist's discovery proved that some embryo fish actually swallowed and fed upon other embryos of the same brood, and thus lived and grew inside the ovarian chamber. The larger larvæ 10 mm. ($\frac{3}{8}$ of an inch) long, lived on the smaller newly-hatched young, not simply upon the surrounding eggs. These larval cannibals showed well-developed breast fins, and anal and pre-anal fin-lobes, but the tail had not any caudal fin-lobes.

Most fish, of course, produce eggs or spawn, and the young develop and hatch after they have been laid by the parent. The formation of the young inside the deposited egg of a fish, may take from 2 days to 6 or 8 months in different species, the shad being an example of rapid development (a few days), while the salmon or trout take a long period of time (many months). But in the parent forms of many viviparous fish the young may be found not only already hatched out and lively, but may be very advanced, and exhibit the almost mature form and appearance. I have frequently examined specimens of viviparous species both on the Atlantic and Pacific coasts, and can confirm Dr. Günther's description that the young, in such fish as *Zoarces*, on the Atlantic, and *Cymatogaster*, on the Pacific, coasts,

*Dr. Gilchrist had in August, 1903, secured a fine specimen 2 feet long.

are so matured at the time of their first extrusion, they swim about with the utmost agility, and Dr. Dowler's remarks on *Pæcilia multilineata* that twenty-two young were packed away in the ovarian sac of the parent, and though no ova were discovered . . . the young fish were one-half inch long, all alike, and exactly resembling the maternal form and proportions. The parent was, it may be added, only 2 inches long. In the sea-perch (*Cymatogaster*) of British Columbia, a viviparous form 6 or 8 inches long, I counted forty-three small, perfectly formed young. They were so advanced and active that when dropped into the sea, just after being extruded from the parent by pressure, they swam away with great agility. It may be that they did not long survive, but to all appearance they were able to look after themselves. Inside the parent I found them closely packed, overlapping each other in the sac, and bathed in a clear serum or fluid, no doubt of a nutrient nature. That they have solid food is very probable in the light of the recent observations just outlined, and though no loose eggs have been noticed in the sac, such eggs may form nutriment for them after their own ball of food-yolk is exhausted.

In the higher orders, the mammals for instance, ova are produced in prodigious numbers each season, even though the young developed and born be extremely few. One author records that over 70,000 primordial eggs are produced annually in a mammalian ovary though the young born may be only one to three in the course of the year.

The survival of the fittest is a principle not applicable only to the mature period of an animal's existence, but may begin with the earliest stages of embryonic and larval life. We see that it finds illustration in the first stages of an animal's life, in the most diverse forms from Mollusks up to Man.

MEETING OF THE ENTOMOLOGICAL BRANCH.

Meeting held at residence of Mr. Arthur Gibson, 9th April, 1908. Present: Messrs. Harrington, Baldwin, Letourneau, Metcalfe, Young, Halkett, Fletcher, Wilson, Newman and Gibson.

Mr. Harrington exhibited 2 cases, which contained his Ottawa collection of Chrysomelidæ. Over 100 local species were represented. This collection proved of exceeding interest to all present and much discussion took place on many of the species. Mr. Harrington drew special attention to those species which are of uncommon occurrence, some of which were repre-

sented by only a single specimen. The Chrysomelids, or "leaf-beetles," are mostly short-bodied, and more or less oval in outline. They are all vegetable feeders and some are very injurious. The well known Colorado Potato Beetle is one of the bad pests belonging to this family.

Mr. Baldwin showed samples of several kinds of blank labels which he had received from the American Entomological Co., of Brooklyn, N.Y. It was pointed out that these labels were very cheap and useful, and as this firm advertises in the OTTAWA NATURALIST the members were requested to bear it in mind when making purchases of an entomological nature.

Mr. Metcalfe exhibited a small box containing a number of spiders' nests, from which parasites had been reared. The common local nest, flat in shape and oval in outline, of a satiny brown colour, had been chiefly collected and from these some parasites of the genus *Pezomachus* had been secured. The name of the spider that made the nest was unknown to those present.

Dr. Fletcher showed a very large specimen of the ichneumonid fly, *Ophion macrurum*, which had been reared from the cocoon of *Telea polyphemus*. It was noticed that the Polyphemus cocoon had been punctured by a woodpecker, but the cocoon of the *Ophion* inside had not been injured, doubtless because of its toughness. The little moth shown at a previous meeting by Mr. Harrington, the larvæ of which fed on *Lemna*, was reported by Dr. Fletcher to be *Nymphula oblitalis*, the identification having been made by Dr. H. G. Dyar, of the U.S. National Museum. Dr. Fletcher also exhibited specimens, in fluid, of the larvæ of the Mexican Orange Fruit-worm fly, *Trypeta ludens*, which had been found at Ottawa in a bitter orange, and brought to one of the botanical branch meetings by Mr. G. H. Clark. When first noticed the larvæ were dead and discolored. A list of species of the genera *Bombus* and *Psithyrus* from various parts of Canada, which had recently been determined by Mr. H. J. Franklin, of Amherst, Mass., was read by Dr. Fletcher and proved of much interest. Local species included in the list were: *Bombus borealis*, *B. impatiens*, *B. pennsylvanicus*, *B. perplexus*, *B. vagans* and *Psithyrus laboriosus*.

Mr. Young exhibited a large case containing about 900 specimens of local microlepidoptera, many of which had been reared by him from larvæ. It is always a pleasure to look over any of Mr. Young's work, and this exhibit was an extremely interesting one. Many of the rarer or recently described species were pointed out and information given as to the food plants of the larvæ.

Mr. Gibson showed specimens of inflated larvæ of some noctuids, which had been collected at Ottawa, or reared from eggs secured from captive female moths. The handsome larvæ of *Mamestra assimilis*, *Peridroma astricta* and *Cucullia intermedia* were included, and attention was drawn to the remarkable change which takes place in the appearance of the latter larva after it passes its last moult. An interesting orange colour variety of the larva of *Cimbex americana*, which had been found on basswood, was also exhibited.

A. G.

NOTE ON A YOUNG SPECIMEN OF THE SNAPPING
TURTLE (*CHELYDRA SERPENTINA*).

A young Snapping Turtle has been received through the kindness of Mr. Capel St. George, of Tramore, Ont., and as it presents certain features which become modified or obscured during growth, the following note may be of interest to the readers of the Ottawa Naturalist.

The length of the specimen from the snout to the tip of the tail is about $4\frac{3}{4}$ inches when the creature is fully stretched; the length of the carapace (or upper shell) 1 11-16 inches, the breadth at the broadest part $1\frac{3}{4}$ inches, and the length of the plastron (or under shell) 1 3-16 inches, the breadth $1\frac{1}{8}$ inches. The length of the tail is about that of the carapace, whereas in the half-grown and adult it is proportionally shorter. The carapace is very rugose and ridged, features which gradually become smoother as age advances. The crests on the tail, which are so pronounced in the adult, are rudimentary. The shell is feebly ossified. The skin, as in the adult, is warty; the warts on the under parts of the juvenile being whitish in colour. The under sides of the marginal shields are white with dark dots, and there are white spots at or near the borders of the plastron.

The Common Snapping Turtle belongs to the family Chelydridæ of the order of the Chelonia or the Turtles; and it may be pointed out that the comparatively small carapace, the small and cruciform plastron, and the incompletely retractile head, indicate the rather primitive character of the family, which contains only two other recorded species: the Snapping Turtle of Mexico and Guatemala (*C. rossignonii*) and the Alligator Snapper (*Macrochelys temminckii*); the latter being the largest of the fresh water tortoises.

The little turtle has been fed at intervals of a few days with dead salmon-trout fry which it eats with avidity.

ANDREW HALKETT.

THE NITROGEN COMPOUNDS IN RAIN AND SNOW.

It may be remembered that one of our addresses at the opening meeting of last winter's lecture course was on "Rain and Snow," the lecturer, Mr. Frank T. Shutt, Chemist of the Experimental Farms, outlining their influence upon the industries, the agriculture and the health of the world.

Perhaps the most interesting part of the paper from the strictly Canadian point of view was the presentation of certain data concerning the nitrogen content of snow—the first of the kind, so far as was known, obtained in the Dominion. The fertilizing value of the "blanket of white" was clearly shown, the 1,000 tons (approximately) of snow per acre which falls during the winter at Ottawa containing a considerable amount of this all important element of plant food—nitrogen—in readily assimilable forms.

For some time past every fall of snow and rain has been analysed at the Chemical Laboratory of the Central Experimental Farm, Ottawa, and in the forth-coming report of that institution further interesting data on this subject will appear. From these results we have been permitted to make the following summary:

For the year ending February 29th, 1908, there fell 24.05 inches of rain and 133. inches of snow, making a total precipitation of 37.35 inches—10 inches of snow being reckoned as the equivalent of 1 inch of rain. The total amount of nitrogen in this precipitation amounted to 4.323 lbs. per acre, and of this approximately 75% or 3.243 lbs. was present in the rain, and 25% or 1.080 lbs. in the snow. We further learn that the solvent action of rain is much greater than that of snow, *i.e.* that rain is much richer, weight for weight, in nitrogen compounds, than snow. Rain, therefore, is the better or more thorough cleansing agent of the atmosphere as regards the ammonia and other gases present that contain nitrogen compounds. Another point brought out by this work is that the first portion of the rain or snowfall is richer than that which falls subsequently and that the period elapsing between the falls has a marked effect on the composition.

Data of a similar character have been obtained in many European and other countries and this work is therefore both useful and interesting for the purpose of comparison. It may be cited as an illustration of one of the many valuable researches undertaken by the Experimental Farm system.

NOTES ON THE SPECIES OF PHÆOCYMA, FOUND IN CANADA.

BY JOHN B. SMITH, SC.D., RUTGER'S COLLEGE, NEW BRUNSWICK, N. J.

The species of *Homoptera* were studied by the Rev. C. J. S. Bethune in 1864, and the North American forms were listed and described in the *Canadian Journal*, Vol. X, for 1865:—a publication not easily gotten hold of at the present time. Most of the material came from Port Hope, Canada, and several new forms, from that locality, were described. That paper forms the basis of our knowledge of the American forms to-day, and as I have just finished a revision of the species from fuller material than was available over 40 years ago, a few notes on the species found in Canada or likely to be found there, may not be amiss.

And first, the name *Homoptera*, Bdv., must fall in favor of *Phæocyma*, Hbn., an earlier name for the same generic concept and *Ypsia*, Gn., comes under the same head. *Zale*, Hbn., differs only on minor points and secondary sexual characters; but may be retained as a section of *Phæocyma* in a subgeneric sense.

P. LUNATA, Drury. Occurs throughout the Dominion east of the Rocky Mountains, after midsummer and until late fall. This is the largest of the species and extremely variable in colour and maculation. The males are more or less marked with blue and may have the entire terminal area blue powdered, and that is the form described as *edusa*, by Drury, the female having been first described as *lunata*. There is a form occurring in both sexes in which the median area is decidedly yellowish, and that was described as *saundersii* by Dr. Bethune.

P. UNDULARIS, Drury. Redescribed by Dr. Bethune as *nigricans*, which is quite as appropriate a name; for the species is intensely black, besides having the wings crossed by undulating lines. I have seen specimens from the eastern provinces only; but the range is probably as great as that of the preceding species, though it is much less common. It flies in June and July. The variety *umbripennis*, Grt., differs in having the median area of primaries much lighter, with a violaceous tint.

P. ÆRUGINOSA, Guenée. Similar to the preceding and occurs with it; but is much rarer. It differs in having an irroration of green or bluish scales and in structure as well.

P. NORDA, Smith. A very brilliant species from Kaslo and other points in British Columbia and Manitoba; the type material coming from Mr. J. W. Cockle of Kaslo. It ranges

eastwardly however, Dr. Fletcher having sent me specimens for determination from Ontario. It is the form listed by Dr. Dyar as *calycanthata* from the Kootenai district. Flies in May and June.

P. MINEREA, Guenée. More like *lunata* in appearance and often confused with it. It is more mottled, however, and differs structurally. An easy way to distinguish it is by the date; it flies in May, June and July and disappears before *lunata* comes on the scene. It is found throughout the eastern provinces and mingles with *norda*, which may be confused with it, in Ontario. Dr. Bethune redescribed it as *albofasciata*, a well marked male serving as type. It might be said that in this and the preceding species the males tend to bluish irrorations, especially in the terminal area.

P. LUNIFERA, Hubner. This is a much slighter species than any of the preceding and of a more even gray tint. I have no actual Canadian records; but I have it from the States just south of the line, where it flies with the next species. It will almost certainly be found in Ontario.

P. LINEOSA, Wlk. This has been confused with *lunifera* and resembles it very much. It is yet slighter, usually paler, and without contrasting maculation. I have it from points in Ontario, and from Winnipeg, Manitoba, June to August. It probably occurs throughout the Dominion east of the Mountains.

P. UNILINEATA, Grote. A very characteristic species for which I have no definite Canadian records. It has been generally recorded from Canada and flies in early spring.

P. LARGERA, Smith. Belongs to the series in which the wings are less trigonate and the undulating very oblique transverse lines are replaced by simpler more upright maculation. The types are from Vancouver Island, May 8th, collected by Rev. G. W. Taylor and sent in by Dr. Fletcher, (male) and Winnipeg, Manitoba, sent in by Dr. Barnes (female). These are the only examples of the species known to me.

P. DUPLICATA, Bethune. A much smaller representative of the same series and a very distinct species. It was recorded from Port Hope, by Dr. Bethune, I believe.

P. CINGULIFERA, Walker. I have no Canadian localities; but the species occurs in Maine and other New England States, so will almost certainly be found in the eastern provinces.

P. HORRIDA, Hubner. A common and well-known species which flies from May to August and occurs throughout the eastern provinces and westward, probably to the Mountains.

From the list of species heretofore credited to Canada *P. calycanthata*, Sm. and Ab., must be dropped. It is strictly a

southern species, and the identifications under that name of Canadian material are erroneous.

On the other hand it is more than probable that several other species will yet be found in the Dominion. These are *obliqua*, Gn., *metata*, Sm., *curema*, Sm., *helata*, Sm., *squamularis*, Dru., *benesignata*, Harv., and *bethunei*, Sm. One of the objects of this paper, indeed, is to call the attention of Canadian collectors to this genus and the work that yet remains to be done in it.

ADDITIONAL NOTES TO THE ABOVE PAPER.

BY ARTHUR GIBSON.

As an addition to the above interesting paper by our honoured corresponding member, Dr. J. B. Smith, the following notes, made chiefly from specimens in the collection of insects at the Central Experimental Farm, are presented.

PHÆOCYMA NORDA. Besides specimens from the type locality, Kaslo, B.C., there are in the collection of the Division of Entomology, specimens from Cartwright, Man. (Heath), and Ottawa (Young). The species has also been taken at Chelsea, Que. (Gibson).

P. CALYCANTHATA. In Dr. Fletcher's Entomological Record, 1904 (Rep. Ent. Soc. Ont. 1904), this species is recorded from Kaslo, B.C. As stated in Dr. Smith's paper this record should now refer to the new species *norda*.

P. MINEREA. In the Entomological Record, 1906, (Rep. Ent. Soc. 1906), this species is recorded from White River, Hudson Bay Slope, June 2nd (W. J. Wilson). On further examination Dr. Smith could not confirm this identification, as the specimen was much rubbed and crushed, and might possibly be another closely allied species. The above record had, therefore, better be cancelled.

P. DUPLICATA. This species has been found at Digby, N.S., by Mr. John Russell. One specimen taken there on June 6th, is in the above collection. It has also been collected at Truro, in the same province, by Mr. L. A. DeWolfe. In the Entomological Record, 1904, a specimen of this moth is recorded as having been taken at Wellington, B.C., by Rev. G. W. Taylor. This specimen is the one referred to in Dr. Smith's paper under the name *largera*. *Duplicata*, therefore, must now be removed from the British Columbia list.

P. CINGULIFERA. This occurs at Ottawa. Last year several specimens were taken by Dr. Fletcher, and Mr. Young has also collected it. All the examples were taken in May. At Orillia,

Ont., the species has been captured by Mr. C. E. Grant, on June 10th.

P. OBLIQUA. A single specimen of this species was collected in 1900, at Bristol, Que., by Dr. Fletcher.

P. HELATA. The only Canadian record we have for this insect is a single specimen taken at Ottawa on June 20th, 1907. by Mr. J. W. Baldwin.

METEOROLOGICAL OPTICS.

BY OTTO KLOTZ, LL.D, F.R.A.S.

As we were returning one evening from one of our delightful afternoon natural history excursions, the bright disk of the moon rose slowly from the eastern horizon and soon emerged as a huge platter, arresting the attention and calling forth remarks from every one.

Probably no illusion in the heavens is so apparent as the increased size of the full moon when rising. Every one knows that the disk of the full moon when seen on the horizon appears very much larger than about six hours later when it is in the south and high up in the heavens. One might infer that the moon is a great deal nearer to us when rising than when seen high up in the sky. As a matter of fact, the reverse is the case, for when the moon is above us it is nearer by the radius of the earth, say about 4,000 miles, or 1-60 of its average distance. If there were any question about the delusion, it is very easily settled by turning an instrument onto the satellite and measuring its diameter, when of course it would be found that the diameter was practically the same in the two positions. Quite a different phenomenon is the flattening of the disk of the moon when seen in the horizon, for this would be confirmed by the same instrument that we used for measuring the horizontal diameter. The explanation of the flattening lies in the fact that the nearer we approach the horizon the more the rays are bent or refracted, so that the lower edge of the moon looks relatively higher than the upper edge, i.e., the lower edge is thrown up more than is the upper one, so that the moon looks broader than it is deep, in short its figure is elliptical. But the discrepancy in the exaggerated size of the moon when rising is not due to the refraction of the rays of light. We may state at the outset that the illusion is a physiological phenomenon.

We are accustomed to speak of the sky as the celestial vault,

or dome, or hemisphere. However, if we sweep the sky with the eye from the horizon to the zenith, or the reverse, it will be seen that the dome is not spherical but that it is flattened, the appearance being that it is farther to the horizon than to the point overhead. The preceding is true whether looked at by day or by night, particularly in a cloudless sky. This is easily demonstrated by estimating say the point of the heavens midway between the horizon and the zenith or the point overhead, and then measure with an instrument the elevation of the point of bisection. It will be found that the halving point is only about half as high as it appears to be. The physiological effect of passing the eye from its normal position towards the horizon, to overhead, is to give the impression of a depressed vault or dome, and the arc we bisect is not that of a semi-circle but the segment of a larger circle. Any one who has been in our Rocky Mountains will recall the impression of "the giants towering to the skies," but when we measure their angular elevation we find the "towering" very much lessened; physiological effect, due to our constitution. A similar illusion we may notice in the apparent size of constellations near the horizon.

The most familiar object for this illusion is of course the moon, although the sun shares it equally, but I suppose the most of us see the moon rise more frequently than the sun, reminding one of the man who when asked, if he ever saw the sun rise, answered, "I don't go to bed as late as that."

Many observations and measurements have been made on the sun and moon by setting up a circular disk and viewing alternately, say the moon and disk, always moving to or from the disk until it appeared the same size as the moon, and then measuring the distance to the disk. From such and mathematical considerations it is found that the moon appears of its proper size when elevated between 30° and 35° , while when it is on the horizon it is nearly two and half times larger, and when high up in the sky only about half as large as it should be.

When Coleridge lets the "Ancient Mariner" say:—

"All in a hot and copper sky,
The bloody Sun at noon,
Right up above the mast did stand,
No bigger than the Moon,"

he gave expression to the fact, just stated above, that our dispenser of life and light, and our satellite appear small when they are high in the heavens.

Now for another phenomenon, that we observed later as the gloaming was receding. Let us paraphrase the well-known couplet into,

"Twinkle, twinkle little star, how I wonder—what makes you twinkle?"

The twinkling or scintillation of the stars has been noticed and noted from ancient times. Aristotle remarks that "the stars twinkle, but the planets do not." Although planets do not scintillate, or do not scintillate as much as stars, yet their twinkling has often been observed. Associated with the scintillation, the sparkling "like a diamond in the sky" is often seen, but this rapid change of color is confined to low altitudes, that is, when the star is not high above the horizon. What seems somewhat puzzling is the fact that when a twinkling star is viewed through a telescope the scintillation ceases, and instead one sees a little disk with ill-defined edge. The phenomenon of twinkling is due to refraction or bending of the rays of light coming through our atmosphere. When the air is "unsteady," this bending becomes unsteady too, with the result that the rays of light from a star are "trembling" and flit to and fro across the pupil of the eye, and make the star twinkle. As a telescope has a very big eye, the object glass, and although the trembling rays fall upon it, it gathers so many that when viewed at the eye-end, the twinkling has apparently ceased, but it makes itself apparent by the little disk of light mentioned above. for it must be remembered that the stars are mere points of light and the most powerful telescope reveals no disk. From this it is obvious why the moon does not scintillate, it has a surface that radiates light, and the individual scintillations from points thereon are drowned, so to speak, in the multitude. As to sparkling, or rapid change of colour, the light, as we ordinarily see it, is white, in reality it is composed of all the colours of the rainbow. These various colours do not bend to the same degree, when passing through our atmosphere, some bend more and some less. From any particular bundle of (white) rays we would receive say only the red rays, from another bundle only the blue and so on; so that collectively we would have the impression of white light, i.e., of all colours combined. This is generally the case when the successive layers of our atmosphere are fairly homogeneous. When, however, this is not the case, when irregular layers of varying densities traverse the air, then the dispersion of the white rays into their constituent colours becomes apparent to the eye, the blending of the colours, or rather of the particular rays which give us the sensation of colour, not taking place so continuously. Hence the star appears momentarily of that colour which is represented by the particular ray that meets the eye. When these irregular conditions prevail in our atmosphere then sparkling besides twinkling of the stars is possible. As these irregularities are mostly confined to the

lower and denser parts of the atmosphere we can understand why stars only sparkle at a low altitude, not much above 30° above the horizon, or about a third of the elevation to the zenith or point overhead. While the twinkling or scintillation is greatest too, near the horizon, and diminishes as the stars get higher and higher, it is not wholly absent at or near the zenith, as is the case with sparkling.

THE OCCURRENCE OF *THYMUS SERPYLLUM* AT RICHMOND, QUE.

By J. C. SUTHERLAND, B.A.

In August of this year (1908) Mr. G. H. Pierce, C.E., of Beechmore Farm, Richmond, brought me a flower specimen which was entirely new to me. As it was, however, plainly a Labiate, I turned to Gray's Manual to identify it. It seemed to answer the description of *Thymus Serpyllum*, but the given range of this species (E. Mass. to Penn.) made the determination doubtful. I therefore forwarded it to Dr. James Fletcher, stating that the nearest I could make of it was that it was a thyme or a savory. He replied at once that it was the Wild Thyme of England, *Thymus Serpyllum*, and that its occurrence here at Richmond was interesting in view of the fact that in Macoun's catalogue the only record of its occurrence in Canada is at Truemanville, Nova Scotia, where it is naturalized in an old field. He therefore asked me to furnish a note as to its occurrence at Richmond.

On the 14th of the month, I visited Beechmore Farm, and Mr. Pierce accompanied me to the large field where it was growing. The largest patch was on the east side of a knoll, about a quarter of a mile from the G.T.R. main line and the same distance from the Richmond and Quebec branch of that railway. The elevation is over 100 feet above the railway. The extent of this patch would be about twenty-five feet square, and the plant had spread in a peculiar semi-circular fashion. There were other patches elsewhere in the field of about a yard square, and there were still smaller ones on the west side of the knoll. The latter ones quite plainly owed their distribution to the harrow.

The plant first appeared, Mr. Pierce informed me, some three or four years ago. Its situation makes it improbable that it is an escape from any garden. The only likely source of introduction would seem to be the grass and clover seed which had

been sown in the field several years ago. This assumption, of course, adds the problem as to where the grass and clover seed received the contamination. Possibly other records of its occurrence in Canada may be forthcoming.

From an agricultural point of view, *Thymus Serpyllum* is not welcome. Its habit of growth here would indicate that it might prove sturdily aggressive. But from the artistic point of view it is very beautiful; and to a Canadian amateur botanist gives meaning, for the first time, to the poet's line, "I know a bank whereon the wild thyme grows."

NOTES ON THE LEPIDOPTERA OF LAKE ROSSEAU DISTRICT, MUSKOKA, ONTARIO.

By ARTHUR GIBSON, Central Experimental Farm, Ottawa.

At the head of one of the many small bays of the above charming lake, the delightfully quiet summer resort of Rostrevor is situated. Surrounded with rich, varied and even virgin woods, it offers many interesting studies to the naturalist. During a three weeks' stay at Rostrevor in September, 1907, the writer spent some time in making collections of the insects of the immediate vicinity. It was late in the season, however, to get any fair idea of the insect fauna of the district, and the weather too, most of the time, was unfavourable. The lepidoptera were given special attention and the following list of species taken is merely presented as a contribution towards a better knowledge of that order of insects occurring in that portion of northern Ontario. It will be noticed that many of the species are common or of widespread distribution, but a few are interesting on account of their rarity or owing to the fact that they are the first Canadian captures of which we have record. The majority of the specimens were collected "at light." Besides the moths which were attracted to the bright acetylene lights on the verandah of the boarding-house, two other kinds of insects were very abundant, viz.: the common and widespread *Polystæchotes punctatus*, and the "lamellicorn" beetle, *Ligyris relictus*. The former has the habit of flying quietly and lazily, but the latter appeared suddenly from out of the darkness, circling around the lights and making a loud buzzing noise, much to the consternation of the guests.

RHOPALOCERA.

Pontia rapae L. Single specimens of this the well-known Small White Cabbage Butterfly were observed from time to time during our stay.

Eurymus philodice Godt. Several examples flying in a pasture field.

Argynnis cybele Fab. } These are all common species
Argynnis aphrodite Fab. } in Ontario. In the Muskoka
Argynnis atlantis Edw. } district, *atlantis* is probably the
Brenthis myrina Cramer. } most abundant.

Polygonia progne Cramer. A few specimens along a roadside.

Euranesia antiopa L. The Morning Cloak Butterfly was seen occasionally.

Basilarchia archippus Cram. One taken on Sept. 8th.

Anosia plexippus L. This usually common butterfly was noticeably scarce during 1907. At Ottawa very few specimens were seen, and only one at Rostrevor.

Heodes hypophleas Bdv. A single example on Sept. 16th.

HETEROCERA.

Sphinx kalmia S. & A. A nearly full grown larva of this hawk-moth was found on Sept. 15th. It was heavily parasitized by a small hymenopterous fly belonging to the sub-family Microgasterinæ.

Telea polyphemus Cramer. One cocoon found Sept 10th.

Automeris io Fab. A mature larva was beaten from basswood on Sept. 12th.

Lycomorpha pholus Dru. One specimen, Sept. 8th. The larva feeds on lichen.

Crambidia casta Sanborn. Several examples of this widespread species were taken on Sept. 4th.

Hypoprepia miniata Kirby. A few, Sept. 5th.

Hyphantria textor Harr. The work of this, the Fall Webworm, was seen Sept. 1st.

Diacrisia virginica Fab. Mature larvæ of this common arctian, were occasionally seen.

Apantesis parthenice Kirby. Specimens taken almost every evening during our stay. This is doubtless the most abundant tiger moth in Canada. The larva is described by the writer, in all its stages, in the Canadian Entomologist, October, 1905.

Halisidota tessellaris S. & A. A few mature larvæ seen. These caterpillars are general feeders.

Halisidota maculata Harr. Larvæ commonly found on alder.

Halisidota caryæ Harr. Larvæ very abundant in the rich woods of maple, birch, etc., wandering about in search of suitable places to make their cocoons. The caterpillar of this species, known as the Hickory *Halisidota*, and that of *H. maculata*, known as the Spotted *Halisidota*, were extremely abundant in Canada and northern United States in August and September. Much anxiety was felt by fruit growers and others in districts where the caterpillars appeared in great numbers. The writer published an account of this outbreak in the Annual Report of the Entomological Society of Ontario, for 1907.

Apatela americana Harr. One parasitized larva was collected, the parasite *Rhogas intermedius* Cress. emerging at Ottawa, Sept. 25th.

Caradrina multifera Wlk. A single specimen taken Sept. 12th.

Hadena modica Gn. Sept. 16th.

Hadena dubitans Wlk. Sept. 3rd.

Hadena devastatrix Brace. Sept. 2nd, 7th, 8th, 9th, 10th.

Hadena arctica Bdv. Sept. 3rd.

Hyppa xylinoides Gn. Sept. 16th.

Rhynchagrotis placida Grt. One specimen, Sept. 15th.

Rhynchagrotis alternata Grt. Two specimens, Sept. 15th, 16th.

Peridroma occulta L. Sept. 3rd.

Noctua smithii Snel. Sept. 4th.

Noctua normaniana Grt. Sept. 7th.

Noctua c-nigrum L. Sept. 2nd.

Noctua rubifera Grt. Sept. 12th.

Noctua collaris G. & R. Sept. 8th.

Noctua clandestina. Sept. 10th.

Feltia subgothica Haw. Sept. 9th.

Feltia jaculifera Gn. var. *herilis* Grt. Sept. 9th.

Feltia venerabilis Wlk. Sept. 5th, 15th, 16th.

Porosagrotis mimallonis Grt. Sept. 5th.

Paragrotis fumalis Grt. Sept. 3rd. This species is uncommon in Ontario. The only other record we have is of a specimen taken at Ottawa by Mr. C. H. Young.

Paragrotis messoria Harr. Sept. 16th.

Paragrotis insulsa Wlk. Sept. 8th.

Paragrotis albipennis Grt. Sept. 5th, 8th, 15th.

Paragrotis ochrogaster Gn. Sept. 15th.

Mamestra meditata Grt. Sept. 9th, 16th.

Mamestra picta Harr. Sept. 5th.

Mamestra renigera Steph. Sept. 2nd, 5th, 12th.

Nephelodes minians Gn. This noctuid was the most commonly occurring species and some beautiful clean specimens were taken.

Heliophila unipuncta Haw. Sept. 11th.

Xylina fletcheri Sm. Sept. 8th.

Cucullia convexipennis G. & R. Sept. 2nd.

Gortyna nictitans Bork. var. *americana*, Speyer. Sept. 15th.

Gortyna immanis Gn. Sept. 8th. This is the most northern record we have for this species.

Xanthia flavago Fab. Sept. 16th.

Eucirrædia pampina Gn. Sept. 4th.

Orthosia bicolorago Gn., var. *ferrugineoides* Gn. Sept. 2nd, 15th.

Orthosia euroa G. & R. Sept. 8th.

Drasteria crassiuscula Haw. Sept. 5th.

Catocala ultronia Hbn. Sept. 8th.

Epizeuxis americalis Gn. Sept. 15th.

Epizeuxis lubricalis Geyer. Sept. 2nd.

Zanclognatha ochreipennis Grt. Sept. 5th.

Palthis angulalis Hbn. Sept. 15th.

Datana ministra Dru. Mature larva Sept. 15th.

Gynæphora rossii Curtis. A single larva of what we take to be this species was found, and fed sparingly on dandelion and plantain after my return to Ottawa. The specimen unfortunately died during hibernation, but it resembled very much the larva of *rossii*, which had been received by Dr. Fletcher from Messrs. Percy B. Gregson and Dalton Tipping, of Blackfalds, Alta., and also other examples of the larva which had been brought back from Hudson Bay by Mr. Andrew Halkett, of the Fisheries Museum.

Tolyte velleda Stoll. Sept. 9th.

Eupithecia quebecata Taylor MS. Sept. 16th; a recently described new species. This is the first Ontario record.

Percnoptilota fluviata Hbn. Sept. 15th.

Hydriomena contractata Pack. Sept. 15th.

Hydriomena latirupta Walk. Sept. 8th, 16th.

Gypsochroa designata Hufn. Sept. 15th.

Petrophora ferrugata Clerck. Sept. 8th.

Deilinia variolaria Gn. Sept. 2nd.

Haematopsis grataria Fab. Sept. 8th, 9th.

Lycia cognataria Gn. Full grown larva on Striped Maple, Sept. 15th.

Ennomos magnarius Gn. Sept. 15th.

Sabulodes lorata Grt. Sept. 3rd.

Subulodes transversata Dru. Sept. 8th.

Nomophila noctuella D. & S. Sept. 4th, 15th.

Pyrausta fumalis Gn. Sept. 3rd.

Scoparia basalis Wlk. Very abundant; observed at light every evening.

Crambus leachellus Zincken. Sept. 2nd, 5th, 15th.

Crambus præfectellus Zincken. Sept. 4th, 5th, 15th, 16th.

Crambus vulgivagellus Clem. Sept. 8th.

Crambus trisectus Walk. Sept. 2nd, 8th.

Thaumatopsis gibsonella Kearf. MS. Sept. 2nd, 3rd, 4th, 15th.

This pyralid was very abundant and specimens could have been taken at light almost every evening. The species was submitted to Mr. Kearfott, who pronounced it new, and it has been described under the above name. Co-types are in the collection of the Division of Entomology at the Central Experimental Farm.

Eucosma confluenta Kearf. Sept. 8th, 16th. Mr. Kearfott says the species is common throughout the Eastern States, and that in Ontario it has been taken at Trenton (Aug. 24) by Mr. J. D. Evans.

Acleris nivisellana Walsm. Sept. 7th. According to Mr. Kearfott, this is a common northern species, ranging from Eastern Canada to the Pacific slope, and down to the Rocky Mountains into Nevada.

Aristotelia roseosuffusella Clemens. Sept. 8th.

Machimia tentoriferella Clemens. Sept. 8th. An eastern species some years abundant in autumn. It has been taken at Toronto in September by Mr. H. S. Saunders. Mr. Kearfott tells us that the larvæ make a web on the underside of the leaves of mostly all of our hardwood trees.

Depressaria lythrella Walsm. Sept. 7th. Mr. Kearfott reporting on this specimen says: "Walsingham bred this from larvæ on *Lythrum alatum*, in Illinois. Nothing but the type specimens were known until Beutenmuller sent me larvæ from the Black Mountains of North Carolina several years ago, on a plant which I believe to be the above species. Your specimen matches those bred from Beutenmuller's material, making the third locality so far known. If the above plant occurs in the neighborhood of Rostrevor, I have no doubt my determination is correct." Dr. Fletcher tells me that *Lythrum alatum* is not recorded from so far north in Ontario, but that *Lythrum salicaria* might be there and the closely allied *Nesæa verticillata* almost certainly is.

Collecting in the above locality in June or July, would, I feel sure, be most satisfactory. Mr. Dinsmore, the proprietor, told me that earlier in the season great numbers of insects are attracted to the acetylene lights on the verandah.

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THE IMPORTANCE OF NATURE STUDY, WITH SOME SUGGESTIONS AS TO METHODS.*

BY J. F. POWER, M.A., TORONTO.

Since most of us were pupils at the primary schools, marked changes have taken place in the subjects taught therein. This need create no surprise. Strange it would be if reforms in education did not keep pace with the revolutionary changes going on in the world around us. To-day, as never before, the plea is being made for a course of study which will better adapt the child to his environment. Hence, subjects like manual training and domestic science are receiving a place on the curriculum. Nor need there be any conflict between these subjects and what have been always considered the essentials of a proper school course; rather will they supplement the latter. I think we are all pretty well agreed as to their educational importance; if so, it is our duty to do all we can to encourage their existence. This we can do by speaking well of them and by giving them our sympathy and hearty support.

There is another subject, nature study, which has been attracting a good deal of attention. It is now about four years since it was formally introduced on the curriculum; and the question may well be asked, what has been accomplished? I venture to say a good deal has been done. We may not fully realize this; we may not be always conscious that we are dealing with nature study when, perhaps, we are doing some of our best work in the subject. We have heard a good deal about it and have listened to considerable discussion upon it; and I think we are, perhaps unconsciously, more interested in the things around us than ever before. I fully believe also that our pupils have imbibed some of this enthusiasm, and that they are beginning to see pleasures in the common things of every day life.

*Read before Ottawa Teachers' Association, May 8th, 1908.

There seems to be some difference of opinion as to what nature study is. With some it is a method of teaching—the natural method. With this opinion I must disagree. I do admit there is such a thing as natural or common sense method in teaching, *e.g.*, if we wish to teach carpeting in arithmetic, the natural method is to have the pupils go through the actual operation of carpeting. There is no question as to the value of this method, but it is not nature study. How can it be, shut off as we are from the very face of nature? With others nature study is confounded with elementary science. 'Tis true that in actual practice it is sometimes difficult to distinguish the two. At least, as teachers, we are so anxious to impart knowledge that I'm afraid we do not always avoid the domain of science. Nature study, however, is not science; it is the study of the objects and conditions everywhere environing us, that we may the better see and comprehend the common things of life; above all, that we may acquire a sympathy with, and a love for nature. In my opinion, it matters little what name we give it, whether nature study or elementary science, or whether we give it a name at all, so long as we endeavor to acquire this sympathy with nature; and, as Bailey says, "To see what we look at and to draw proper conclusions from what we see."

As to its educational values, I need offer no special plea. On this topic you have already listened to much discussion. It rests upon the same psychological basis as domestic science and manual training, and is advocated by most of the distinguished educators of the present day. We are all well aware of the "knowledge never learned of schools," which a child acquires during his early years; the idea is to continue, as far as possible, the same natural means of educating. It is claimed our school work has been too bookish; we talk about sense perceptions, sense training, objective teaching, and concrete notions; and yet, we cling to our books as closely as ever. If there is anything in the educational principles, from percept to concept, from particular to general, surely it is in nature study, with its objective realities, that they receive their truest and widest application. The subject, therefore, rests upon rational and sound pedagogical principles. Moreover, few other subjects on our curriculum give anything like the same training in observation, nor does it stop here; the child must interpret what he sees, thus his reasoning and judgment are exercised and trained; his mental activities are made the most of and are directed along useful lines. The child is interested in the common things about him; if we are to succeed as teachers we must take advantage of this interest and

seize upon this mental desire for knowledge, otherwise it will fade away and a golden opportunity is lost.

Not only is nature study pedagogically sound, but it is also the very foundation of many of the other subjects we are called upon to teach. Much of geography is essentially nature study. I'm afraid, however, we do not always go to nature and the world outside to give our classes concrete notions in this subject. We have been too long adhering to the text-book and the classroom. In art much of the material employed is taken from nature, and the better a child is able to see and to interpret this material, the better will he be able to give expression to it. Much of the literature taught in the various grades abounds in nature pictures, and what child, who has never learned to examine and to verify these, will appreciate and enjoy the sentiments of the poet? The material for much of our work in composition may also be taken from nature study topics, thus, by correlation, it will prove a help in our ordinary school work and not a hindrance.

There is another and, in my opinion, the most important value of nature study, viz.: the influence it has on the character of the child. We emphasize character building, and rightly so, as the chief object of education. In no way, however, can we influence a child's character more than by giving him a love for nature, a love which will prove a solace to him when tired of the monotony of every day life. It gives a sympathy not only between teacher and pupil, but also with every living thing. The more we know of nature the more humble we must necessarily become—since a knowledge of nature lifts the veil of science, that unlimited field of knowledge, and makes us feel how very little we know. Not only does it make us humbler, but also kinder, more patient and more considerate. This may be said to be the æsthetic or emotional value of the subject; and who will deny that the æsthetic training of our pupils is daily becoming more necessary?

As this country grows older and becomes better settled more attention will be given to decorations and general improvements. Already in this city, the matter is assuming large proportions, in the efforts that are being made to make Ottawa the Washington of Canada. If the work is to be a success we must do something in our schools to help it along and to enable our future citizens to better enjoy their surroundings. We look upon the C.P.R. as a soulless corporation without a spark of sentiment or refinement; and yet, I notice that orders went forth the other day to have a flower garden at every station across the continent and seeds were distributed for that purpose. Think of the comfort, the pleasure, the solace that will come to many a

weary traveller when beholding those flowers; and to the station agent and his family, in many an out of the way place, in tending and caring for them. If the C.P.R. is alive to the necessity of those things, surely we, the teachers of this province, should not be left behind. What an opportunity there is to give such a training by raising flowers in connection with our schools! Perhaps the most valuable lesson that has been given in this city in this connection was that given last fall by His Excellency, Earl Grey, when he had some hundreds of the school boys take part in the planting of bulbs at Rockcliffe. The animal nature is evident in us all; let us check it by cultivating the emotional and æsthetic side. For this purpose nature study has the same claim on our curriculum as art, music, or even good literature.

While the educational value of the subject is pretty freely admitted there are some imaginary objections to its universal adoption. The chief of these is the lack of time; it is quite true that teachers are, as a rule, pretty busy. So far, however, as our urban schools are concerned I need scarcely remind you that overteaching is one of our greatest weaknesses. Too much is done by the teacher and too little self-effort or self-investigation is demanded from the pupil. I am old-fashioned enough to champion the three R's. These, in my opinion, must continue to form the basis of our school work. Is it not possible, however, that we are spending too much time in grinding them and that equally good results might be obtained in a shorter period? I have every faith too in giving our boys and girls a taste for the right kind of reading; and the teacher, who is succeeding in doing this, is doing a work of the highest educational value. I am well aware that some of the advocates of nature study are apt to speak slightly of books and to maintain that our pupils must become original investigators. While it is important that we, as teachers, should encourage, as far as lies in our power, the spirit of self-discovery, the great majority of mankind must ever depend upon books for the bulk of their knowledge. There is, however, no quarrel between nature study and the three R's. Those teachers who fly in the face of nature study in defence of the three R's are not always the ones who are doing the best work in the latter; as a rule, the teacher who does the three R's best will also do nature study best and will find time to do it. Let me repeat, nature study, if properly taken up, will prove an assistance to the rest of the schoolwork; and the three-quarters of an hour or hour devoted to it each week will prove a delightful recreation from the ordinary school grind. I am satisfied too that many of the lessons we give in nature study

will remain green in the memories of our pupils when perhaps many of those given in other subjects are gone and forgotten.

Another objection, frequently advanced, is that the teachers are not specially prepared to teach the subject. This is no insurmountable objection. A great deal of knowledge is not necessary. What is specially required on the part of the teacher is a belief in the educational values of the subject combined with a strong desire to do the work, and with an earnest effort and a will to become better acquainted with the common things around us. That most of us are entirely unacquainted with our surroundings need scarcely be affirmed. Is it not our duty to do all we can to remedy this state of affairs? The old saying, "Where there's a will there's a way," holds specially true in the teaching of nature study. Enthusiasm counts for more than anything else. The difficulty is we have become so accustomed to the pouring out of knowledge to our pupils that we are ashamed to say "I don't know"; after all, how little any of us know! Why can't we give our pupils some topic to investigate and at the same time work with them? It may be how an apple is formed in the bud, or how a maple tree gets out of the seed, or the various changes through which a butterfly passes. In investigating these topics with our pupils, being willing to have them teach us if necessary, our knowledge will soon increase; and our confidence in and love for the subject will lead us to do better things. Moreover this mutual effort of teacher and pupil to investigate together will do more to stimulate the latter to self-exertion than will all the second-hand information we can otherwise give him. I am not denying the importance of and the necessity for knowledge on the part of the teacher; what I do say is, that lack of knowledge need not deter us from taking up the work. Besides; too much knowledge may lead us into our present fatal error of telling what the child should seek for himself.

It is true that the subject, as dealt with in many of the texts, is quite exhaustive; and is sufficient to discourage the average teacher who has done little in the various sciences. Nature study, however, as I have already said, is not science. It takes things as they are around us and endeavors to understand them without any attempt at systematic order or classification; it is wholly informal and is free from definitions and technical terms. We may be interested in insects, their habits and metamorphoses without attempting to know anything about them from a scientific point of view. Leave all that to the specialists. We may take much pleasure in birds, their songs, migrations, habits, and uses, without ever having heard of

ornithology. Just as in literature we may appreciate the beauty, the sentiment, and the feeling without entering into a detailed analysis of it, so in nature study we may learn to love a flower, a bird, or an insect without having any technical knowledge concerning any of them. Of course in taking up the work a vast fund of knowledge is sure to be acquired by the pupil and this knowledge will form, later on, an excellent scientific foundation.

There is no doubt, however, that the complexity of material is a stumbling block, hence the necessity for some outline of work for the various grades. There must be a great deal of elasticity in the course laid down and there need be no special order for taking up the work, except what may be incidentally suggested, as the teaching of a lesson in literature, a topic in geography or any other individual occurrence. It is well too, in graded schools that, while each teacher is given great latitude, some definite course be followed in each grade. Otherwise much confusion and useless repetition are sure to follow. The work for each grade, as outlined in the school regulations, is merely suggestive and may be supplemented to meet any local conditions. The course to be followed should deal with plant and animal life, the earth itself, the sky, the atmosphere, in fact everything around us. I understand some such course is being outlined for the various grades in your schools; it is, therefore, unnecessary that I say more on this phase of the subject.

I do strongly advocate, however, that, during the long winter seasons when out-door work in nature is practically impossible, or at least very difficult, more attention be given, especially in the Third and Fourth Forms, to elementary science. I am fully aware that it has been, and is to-day, customary to introduce this phase of school work in the High or Secondary School. This I consider a mistake. There is much in elementary physics and even in chemistry that the average child, who will never go beyond the primary school, might take up with great profit. In fact the course outlined in the regulations covers some of this work. I see no valid reason why those Forms should not have simple experiments to show them the chief properties of air—such, *e.g.* as its composition, weight, pressure, the structure and uses of a barometer; simple experiments on water, *e.g.* hard and soft, chief impurities, filtration, evaporation, condensation and buoyancy; on heat, such as sources, expansion by heat, conduction, convection, radiation and the structure and uses of thermometers; simple lessons on the cause and transmission of sound, light, etc. There is, in all this work, much valuable information which will enable pupils to better

understand their surroundings; for what things are so common as air, water, heat and soil. The proper understanding of these will enable the pupils to more easily comprehend the facts of geography, physiology, and other subjects that are taught. I realize that this would involve having in each school simple apparatus to carry on the work. The cost would not be great and the interest taken by the pupils and the value derived from two such lessons each week would more than make up for it.

Let me pass on to what we may call the general method of treatment of nature study. It is so wide and is of such a nature, it may be said that each teacher must be a law unto himself. Certain it is, that the method to be employed must be almost as informal as are the topics to be studied. It would prove fatal to the subject to set down hard and fast rules for its treatment. It may be truthfully said that the feeling and disposition of the teacher towards the work counts for more than any formal method. What the teacher requires more than method is a love for nature; this love, combined with a reasonable amount of knowledge and with a desire to get more, will doubtless bring success. This does not mean that children are to be taught by the teacher. The former are to find out facts for themselves under the guidance and direction of the latter who must always keep her knowledge in the background. It is a golden rule that the child must not be told what he can reasonably find out for himself.

We frequently hear it said that a child is a born naturalist. This statement I consider extreme. It is quite true, I think, that childhood is the age when most enthusiasm can be produced; when the mental activities are seeking to be satisfied. In later life we become set in our ways and notions, and it is more difficult to produce an impression upon us. Our own experiences, however, will teach us that a child may live daily surrounded by nature without learning to interpret what he sees. The direction of a teacher is necessary. How many people there are who are quite familiar with mosquitoes and with the "wrigglers" of a water barrel, but who never for a moment connect the two and who are surprised when they are told that both are stages in the life history of this insect. We must take care then that children do see; and by well directed and judicious questioning we must assist them to interpret what would otherwise have no meaning for them. Mere contact with nature or with natural objects is insufficient.

If nature study teaching consisted in setting before the pupils a number of facts in nature to be memorized, or a number

of objects about which they were to find out facts as best they could, the work might be easily done. But it is neither the one nor the other. The main question for the teacher is, what is the best way to bring the material before the pupils in order to get the most self-effort from them? A question is always a challenge to a child, especially if that question is in the shape of a problem to be solved, *e.g.*, where do the birds that remain with us all winter secure their food? On what kind of day do the streets dry up fastest? In what part of the sky do you look for a new moon? How is a duck specially adapted for swimming? Why can it keep warm while swimming in cold water? By questions such as these the children are kept on the alert looking for something on which they are to report. Thus are they learning to look around them and soon the habit is formed. Another thing in which the teacher must be very careful is not to discourage pupils by forgetting to take up problems thus set them, or by giving little attention to objects they may bring in for examination. Children are very sensitive in this matter and a little thoughtlessness on the part of the teacher may cast the shadow of discouragement over them.

The time of year, too, must necessarily influence the work to be done, *e.g.*, spring time is the season for the germination and planting of seeds, the setting out of flowers, the opening of buds, the return of the birds, etc. In the fall, comes fruits and seeds, the means of dispersion of the latter, caterpillars and cocoons. Some topics may require more than one season to work out, *e.g.* the metamorphosis of a butterfly, the growth of a plant from seed to fruit, etc. The weather we have always with us; and it furnishes many interesting topics for investigation.

Many of the lessons in our readers abound in nature study topics and furnish an excellent means of treating it incidentally. In our general literature too, is to be found much, both in prose and poetry, which is descriptive of nature, and the reading of which by our pupils will do a great deal to create a disposition to become better acquainted with her. Moreover, this incidental treatment of the subject is of great value and does away with the excuse of lack of time for more formal nature work.

The teachers of this city have every advantage in cultivating the acquaintance of nature. I know of no other city offering like facilities. Here live many of the best experts in Canada who are ever ready and willing to render assistance, and an association with whom is an inspiration in the work. You have here also the Field-Naturalists' Club, an organization of wide reputation,

the president and the secretary of which, we are proud to number among our fellow teachers. Take advantage of these facilities and I am sure you will soon become more interested in a subject which, for pupils in our day, had no existence.

In conclusion, I have tried to present this subject to you not from the standpoint of the faddist, but from the standpoint of one who believes that our primary schools, dealing as they do with the masses, must continue to fit our people for the affairs of every day life. At the same time I am convinced we can do much to train the future men and women of this province, that there is lying everywhere around them a means of creating a disposition to appreciate the sentiments of the poet who said:

“Nature never did betray
The heart that loved her; 'tis her privilege,
Through all the years of this, our life, to leap
From joy to joy; for she can so inform
The mind that is within us, so impress
With greatness and beauty, and so feed
With lofty thoughts, that neither evil tongues,
Rash judgments, nor the sneers of selfish men,
Nor greetings where no kindness is, nor all
The dreary intercourse of daily life,
Shall e'er prevail against us, or disturb
Our cheerful faith, that all which we behold
Is full of blessings.”

SOME BIRD HABITS.

BY NORMAN CRIDDLE, TREESBANK, MANITOBA.

Several years ago my brother Stuart drew my attention to some remarkable habits practised by the Killdeer Plover while endeavoring to preserve its eggs from enemies. He had observed that this bird, while sitting upon its eggs, when disturbed by a dog, would leave the nest and flutter along the ground as if badly injured, as many other birds are known to do, and so entice the dog away. But, if the danger came from a cow, or horse, the tactics were changed and the bird, with wings and feathers spread out, would run into the animal's face and so by startling it drive the intruder aside. In the former instance the

bird left its eggs while the dog was some distance away, but with cattle it waited until almost touched before moving, so that its sudden appearance was more startling.

It would, of course, be a fatal mistake were the latter method employed to drive away a dog, or coyote; while the former would prove useless as a means of preventing cattle from treading upon the eggs. Hence, two habits to gain the same end.

It might be asked how a bird had acquired so much wisdom in being able to distinguish between an enemy which would eat both bird and eggs if opportunity offered, and a generally harmless cow from which the only danger would be of accidentally treading upon the eggs. And also, how it had learned to employ methods of defence so totally different. I believe the answer is this. Before the advent of civilization the prairies were inhabited by countless numbers of buffaloes, while coyotes as well as foxes were also more numerous than they are to-day. The Killdeer is a bird that nests in open spots, usually on dry low hills not far removed from water. Consequently, the eggs and young would often come in contact with these mammals, and if the parent bird did not resort to some artifice, their offspring would often suffer. The parents which contended most successfully with enemies would naturally rear more young. Thus, by the "survival of the fittest" the instinct—I believe it is an instinct—has been acquired. I have observed these birds practise both methods with success when contending against crows, but man, they rank with coyote and dog and only feign injury. They consider—unfortunately rightly—that we are not to be trusted.

The American Goldfinch, often wrongly called Wild Canary, nests very late in the season, in spite of the fact that in some parts of the country, such as at Ottawa, it is a permanent resident. I remember puzzling over the reason of this late nesting until it occurred to me that the young were fed principally upon the seeds of wild sunflowers and similar plants such as Gaillardia, burdock, thistle, etc. Then the reason became plain: these birds waited until the seeds were ripe so that they would have an abundance of food both for their young and for themselves, during the breeding season. In Manitoba the sunflowers are much preferred, and I believe this is due partly to the birds' plumage harmonizing so remarkably with the flowers. Earlier in the season they feed to a large extent upon dandelions and Gaillardia seeds, both yellow-flowering plants.

At one of the Ottawa Field-Naturalists' Club excursions last spring, at which I had the pleasure of speaking, I made the rather loose statement that the American Cuckoos differed from the European species in that they reared their own young. While this is generally speaking true, the habit—as pointed out by Mr. Halkett*—is not quite so distinctive as my remarks might lead one to imagine. I have never personally found American Cuckoo eggs in the nests of other birds, though, I believe, there are records of such having been found. I have, however, on several occasions discovered more than the usual number of eggs in a nest, and in one instance found ten under one bird, which would indicate that at least three birds were responsible for them. Unfortunately the eggs were abandoned and consequently never hatched. There are also, I believe, instances on record of the European Cuckoo rearing its own young.

Writing of Cuckoos, brings me to a doubtful case of the same habit practised by the Redwinged Blackbird. The usual number of eggs is four or five, but on several occasions I have found nests containing six or eight, and once nine, which leads me to the belief that these might be from more than one bird. I am also suspicious as to whether the birds are not somewhat sociable in their nest-building operations. That is, whether more than one bird engages in building one nest. But this subject must be dropped for the present as not proven. I have introduced it in the hope that others might be able to throw light upon the matter.

The Mourning Dove has increased very largely within the last twenty years and in some respects is taking the place of the once abundant Passenger Pigeon, which it somewhat resembles in coloured markings. It seems well adapted to the changed conditions brought about by the ploughing up of the country. It delights to feed upon stubble fields or on waste land where weed seeds are plentiful, and seems rather partial to Green Foxtail (*Setaria viridis*), also not taking amiss to a good feed of wheat when opportunity offers. These birds often congregate in small flocks, sometimes several hundred being seen together, but they nest in solitary pairs. They are very fond of salt, like the domestic pigeon, and if they ever become too numerous could probably be captured by using salt as a bait. On examining the nests of doves at different times of the year, I have noticed the rather interesting fact that the nests are

*Ottawa Naturalist, Aug. 1908, page 95.

usually, if not always, more warmly built late in the season, doubtless to protect the eggs and young from cold, though I have no records tending to show that the habit is practised in the spring when the weather is often equally cold.

The young of the Osprey are said to have an inclination to hunt birds and mammals. Some naturalists claim that they are taught to abandon this habit by the parent birds, after which they devote their time to hunting fish. I am always rather skeptical about this "schooling" idea. It seems to me that a certain modern class of nature writers attribute altogether too much to this method of acquiring knowledge among wild animals. I have observed that young Marsh Hawks have much the same habits of differing from the adults in the matter of food. The young, as soon as they learn to catch for themselves, devote a large portion of their time to hunting young grouse which they destroy in considerable numbers. This habit only lasts about a month, after which small rodents form the bulk of their food supply, as is the case with the adults. The question is, do these young birds later find the grouse too strong and fast, and so are obliged of necessity to turn their attentions elsewhere; or are they taught by their parents that grouse hunting is bad for them? The question might be answered by another. If these hawks can capture grouse to advantage why should they leave them to seek other food of which a larger quantity would be required to appease their appetites?

There is no doubt, however, that parent birds do teach their young certain habits. I have watched both the Marsh and Swainson's Hawk teaching their young to catch the food that is brought to them. The old bird would soar above the young, which seemed keenly on the watch, and suddenly drop the food to be caught. If it were missed the parent would swoop gracefully down and secure it again before it had time to reach the ground, and the lesson was continued until one of the young accomplished the task. So we must admit the teaching of parents in wild life. The problem is where to draw the line between teaching, learning by experience, and instinct.

The 45th annual meeting of the Entomological Society of Ontario, will be held at the Ontario Agricultural College, Guelph, on November 5th and 6th. Dr. E. P. Felt, New York State Entomologist will deliver the evening popular lecture. At the day sessions papers of economic and scientific interest will be read. Dr. James Fletcher is the retiring President.

COUNCIL MEETING.

A meeting of the Council was held in the Carnegie Library on September 8th, with the following members in attendance: the President, Mr. A. E. Attwood, Miss E. E. Currie, Messrs. A. Gibson, H. H. Pitts, and T. E. Clarke. The following were elected ordinary members:—

1. Mr. Thos. Jamieson, B.A., Inspector of Public Schools, Carleton County.
2. Mr. H. Groh, B.S.A., Central Experimental Farm.
3. Mr. J. W. Swaine, Macdonald College, Ste. Anne de Bellevue.
4. Mrs. F. W. Carman, Ottawa.
5. Mr. Ward M. Irvin, Ottawa.
6. Miss F. J. McNeill, Ottawa.
7. Mr. W. A. Dent, Collegiate Institute, Sarnia.

The Secretary reported that a meeting of representatives from various literary and scientific associations of Ottawa was held in the Speaker's Room, House of Commons, on June 3rd, when the following resolution was adopted unanimously:—

“Resolved that this meeting recommends to each of the societies represented, and other societies of a similar nature in Ottawa, the consideration of the desirability of having one course of free popular lectures under the auspices of the various societies united for that purpose only, it being understood that the proposed course of lectures is not to interfere with the meetings or lectures of each society under its own special arrangements. That a joint committee meet for consideration of the subject as soon as all are chosen. That each society send in the name of the delegate elected to Dr. J. F. White, Principal of the Normal School, who will call the meeting.”

A programme of autumn excursions was arranged for as follows:—

September 12th—Central Experimental Farm.

September 19th—Fairy Lake and Beaver Meadow.

September 26th—Rockcliffe, McKay's Lake and outlet.

Mr. Gibson suggested the advisability of making a Club Exhibit at the Central Canada Exhibition on some future occasion, the exhibit to be composed of material from the collections of individual members.

THE COTTON-TAIL RABBIT IN ONTARIO.

BY J. H. FLEMING, TORONTO.

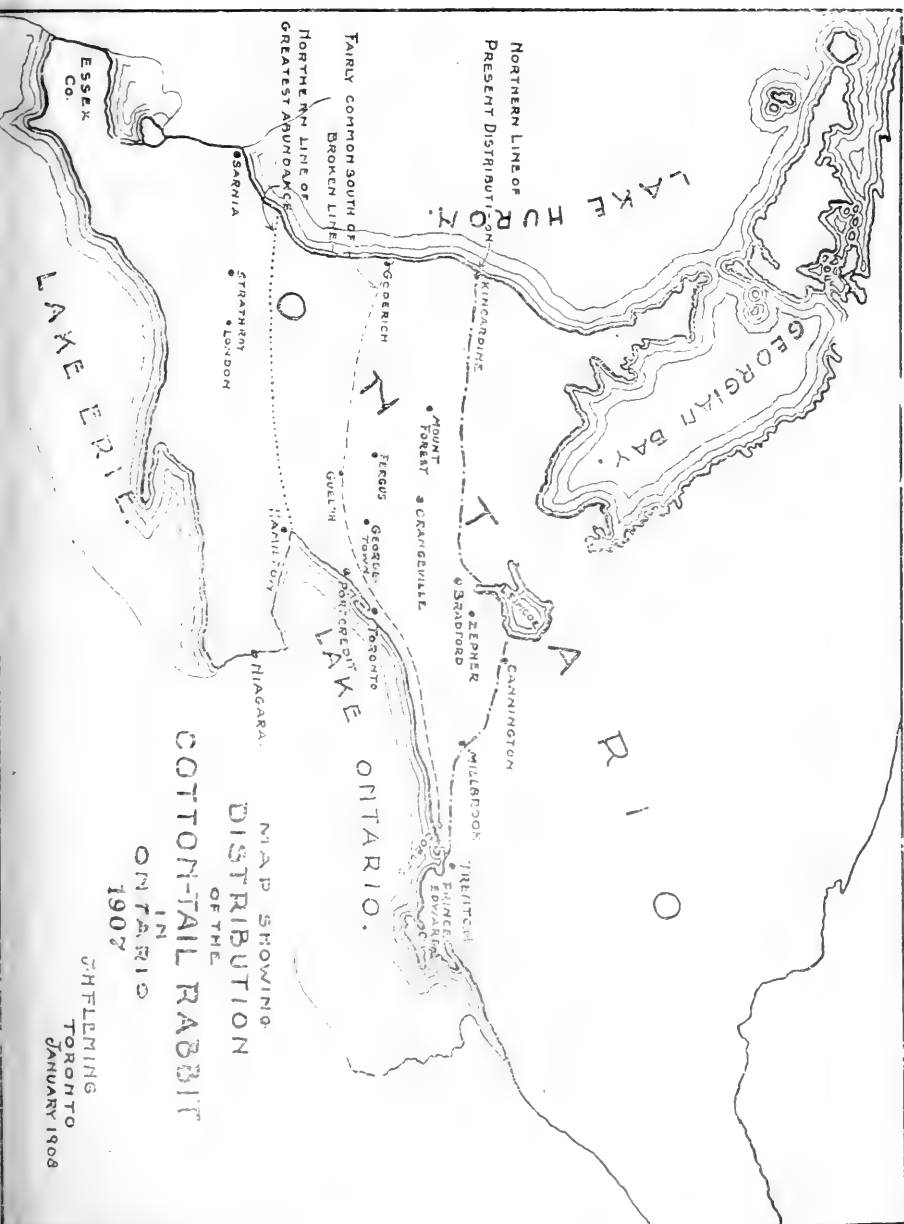
This rabbit was not, so far as can be ascertained, indigenous even in south-western Ontario, where the faunal conditions are strongly Carolinian and favourable to its increase. While no very definite date can be given for its first appearance in the south-western counties, it has been a resident in Essex for at least forty years. At Niagara the first cotton-tails were noticed in 1871; this is the date given by Mr. C. W. Nash and agrees closely with that of others. Mr. Ernest Seton says that rabbits were seen in Peel in 1872; westward they were recorded at Strathroy by Mr. Walter Brett in 1882. At Toronto, there is some confusion, owing to the attempted introduction of English rabbits and the coming of the cotton-tail was overlooked; but Dr. Brodie considers the date was about 1884. Specimens were taken at Lorne Park, by Mr. Seton, in 1887, and Mr. Allan Brooks states that they were not abundant at Milton till 1888.

During the last twenty years the range has steadily increased, but the centre of abundance still remains south of the line drawn from a few miles north of Sarnia, to the west end of Lake Ontario, as shown on the accompanying map. North and east of this line the cotton-tail is subject to climatic conditions that keep it in check, and were it not for a constant migration from the south and west counties very few would remain after an unfavourable season; and in any case, the natural increase is kept down by the hunting the animal is subject to at all times.

The cotton-tail in winter often finds refuge under barns, but it is usually to be found near the woods, showing a decided preference for hardwood ridges. Solitary ones may be found in old skunk holes at all seasons. A common way of hunting them is with ferrets. There have been numerous attempts to introduce this rabbit, but the present range is due to the migration of the animal itself.

EXCURSIONS.

The first of the autumn excursions of the Club was held on September 12th, to the Central Experimental Farm. The members of the Ottawa Horticultural Society also visited the Farm the same afternoon, and the two societies joined forces and were conducted around the Farm by Dr. Fletcher, Mr. W. T. Macoun and other members of the staff. About 150 in all



were present. Mr. Macoun directed special attention to the hedges near the poultry houses and to the different groups of trees and shrubs in the Arboretum, or Botanic Garden. The various beds of late flowering plants in the central lawn, such as cannas, asters, etc., were much admired. An interesting feature of the excursion was a visit to the new horticultural building. Here everyone was treated to a liberal supply of plums, apples and melons. The musk melons were in fine condition and, of course, were very much enjoyed. While in the building short addresses were delivered by Dr. Fletcher and Mr. Macoun. Dr. Fletcher outlined some of the work which is carried on at the Farm, referring particularly to that of horticulture by Mr. Macoun, the Horticulturist, and spoke in high terms of the success which had attended his efforts in developing that branch of agriculture in Canada. Mr. Macoun explained the objects of the new building and said that he hoped during coming seasons to have on exhibition samples of the different kinds of vegetables and fruits which were best grown in the Ottawa district. These would be shown in glass covered cases and could be seen in their proper season. He hoped also to have meetings of horticulturists, from time to time, in the building, when the new car line to the Farm is in operation. From the standpoint of the Ottawa Field-Naturalists' Club, the excursion was a most unique one, and was much enjoyed by all the members who were present. It is to be hoped that another joint excursion of the two societies may be arranged for at some future date not too far distant.

A. G.

SUB-EXCURSION TO BEAVER MEADOW AND FAIRY LAKE.

The second of the autumn excursions of the Club was held to Beaver Meadow and Fairy Lake, on Saturday, September 19th, under the leadership of the President, Mr. A. E. Attwood.

The day was ideal, a timely rain the previous night having cleared the air of the dense and oppressive smoke with which the forest fires had obscured everything. Over sixty members and others, including a strong representation from the Normal School, availed themselves of the opportunity for a pleasant outing, in a hunting ground well and favorably known to all of the older members. While this is not the season for the best results from the collector's standpoint, there was nevertheless much to be observed; and the freshness of this retreat was particularly remarked upon, in view of the general parched condition of vegetation, owing to the long-continued drought. After some time spent in skirmishing in the woods flanking the meadow,

the party proceeded to Fairy Lake, a beautifully retired spot. On its rocky banks, the afternoon's treasures were discussed, and several interesting addresses were listened to.

Dr. Blackader reviewed the half dozen species of ferns which had been collected. Some of these were shown to be in the fruiting condition; and examples of the curious "bladders" on the leaves of the Bladder fern were also exhibited.

Prof. McCready, of the Ontario Agricultural College, Guelph, was then called on. In view of the presence of so many from the Normal School, he spoke more particularly on what the Macdonald Institute is prepared to do for teachers. A three months' Summer School will be held again next year, at which teachers may get a training in nature study, school garden work and elementary agriculture. Rural school teachers should be able to appreciate the conditions on the farm, and while they can not be expected to teach the people how to farm, they can still be, to quite an extent, a medium between the college and the farm. Prof. McCready also believes in nature study, which has an agricultural bearing, or in other words, which utilizes the everyday things of the farm as its objects of study.

Mr. J. W. Gibson, of the Normal School, called attention to the various maples seen, and also explained some points with regard to the autumn colouration of leaves, examples of which were already to be found.

Mr. J. H. Putman exhibited several climbing plants, including Canada Moonseed and Climbing Bittersweet. He also called attention to the Poison Ivy growing all about, and showed that its poisonous properties were often over-estimated.

Some alder twigs bearing specimens of woolly aphids were shown by Mr. H. Groh, who spoke about the nature of the secretion which gave this woolly appearance, and about the honey dew secreted by many aphids.

Mr. Arthur Gibson, besides presenting some specimens of interest, outlined briefly some of the aims of the Club. One of these was to still further increase the already large membership; and to this end he extended the Club's invitation to all who were interested in its work, to become members. The improvement of the OTTAWA NATURALIST, its official organ, was another important aim of the Club. It continues to attract articles from many of the best known naturalists.

In the course of his duties as Chairman, Mr. Attwood contributed many valuable points. In speaking of oaks, he classified them all as either black or white, and gave several easily remembered characteristics by means of which they could be placed in one or the other of these groups.

H. G.

SUB-EXCURSION TO MCKAY'S LAKE.

This autumn's sub-excursions have been most interesting and enjoyable and the one held on September 26th at McKay's Lake was certainly not an exception. The woods around this charming little sheet of water are beautiful at any time, but the gay colouring of the fall season seemed to lend additional charms. The attendance was not as large as at some former outings, there being only about fifty present, but never has greater interest been shown in the finds of the day.

Strolling slowly along through the woods on the lake side, the whole topic of conversation seemed to be on the different points of interest in nature about them.

Some time was spent at the sand pit, and here Mr. McNeill gave much interesting information concerning the sand deposit and also about the formation of marl found in that locality.

Returning at 4.30 to a pleasant knoll, overlooking the lake, the company listened with much interest and profit to addresses by several of the Leaders.

Mr. Arthur Gibson presided, in the absence of the President, and first called on Mr. W. T. Macoun, who spoke of the various trees met with during the afternoon, making his talk doubly forcible by passing around a small branch of each kind, and explaining the difference between closely related species. This created such an interest that quite a discussion followed.

Mr. McNeill spoke of certain aquatic plants, and of the pleasure to be had from keeping an aquarium. He gave many practical hints of how to manufacture one at a very slight expense. Mention was made that great care should be taken in filling the aquarium, so as to have the right balance of animal and vegetable life, or the consequences would doubtless be discouraging.

Mr. J. W. Gibson corroborated what had been said by Mr. McNeill and affirmed that he had found an aquarium a source of great interest as well as profit. He also spoke of the difference to be found among plants at different elevations.

Mr. H. Groh said a few words about the birds noticed during the afternoon, giving a list of those observed, and Mr. Arthur Gibson showed the very beautiful chrysalis of the Monarch butterfly and described the life-history of the insect. He also told something of the insects that spend the winter in the heads of the common mullein and in the stems of the golden rod.

E. E. C.

NOTES.

THE WORM-EATING WARBLER IN ONTARIO.—On the morning of May 28th, 1908, I took a male Worm-eating Warbler in a maple wood, with chestnut ridge, about three miles west of London, Ont.

My attention was attracted by a song which seemed to be that of a Chipping Sparrow, delivered very rapidly but with a tone a trifle more musical than is the case with the sparrow. After some search we found him sitting still about fifty feet up and with a glass I could see a warbler's bill and could tell that it was flesh coloured, although the light was too poor to show anything more. A lucky shot brought him down and I had the pleasure of picking up the first Worm-eating Warbler recorded for Canada.

In thinking the matter over I remembered having heard a similar, but not identical, song about a week before, ten miles farther west but was unable to even see the author of the note. Since then I have been told that this warbler was accurately described by a boy living not far from where mine was taken, so that it is possible more than one have been about. Three or four years ago Prairie Warblers were reported and taken in several places throughout the province where they had not been seen before and it is possible that this year may see an occurrence of Worm-eating Warblers which will parallel that of the other species.—W. E. SAUNDERS, London, Ont.

NESTING OF THE BARTRAMIAN SANDPIPER.—On May 26th, 1908, while passing through some fields near Morrisburg, Ont., I was surprised by flushing a bird of the above species. In a minute the nest and four fresh eggs were found. The nest was built in a dry, scrubby field, where Meadowlarks were nesting. The bird had excavated a hole about the size of a saucer, and lined the same with a few dead grasses, the whole being partially concealed by long grass.—W. J. BROWN, Westmount, Que.

CYPRIPEDIUM ARIETINUM ON THE SHORE OF LAKE ERIE.—On May 30th, while exploring Turkey Point with Mr. J. S. Wallace, of Toronto, we found a large patch of Ram's Head Lady Slipper within one-quarter mile of Lake Erie, which was growing in the more open places in a cedar thicket and appeared to be flourishing. We brought away about 20 roots for the garden but we made no serious impression on the numbers of the colony. I had found this plant on the shore of Lake Huron in two places, but never on Lake Erie.

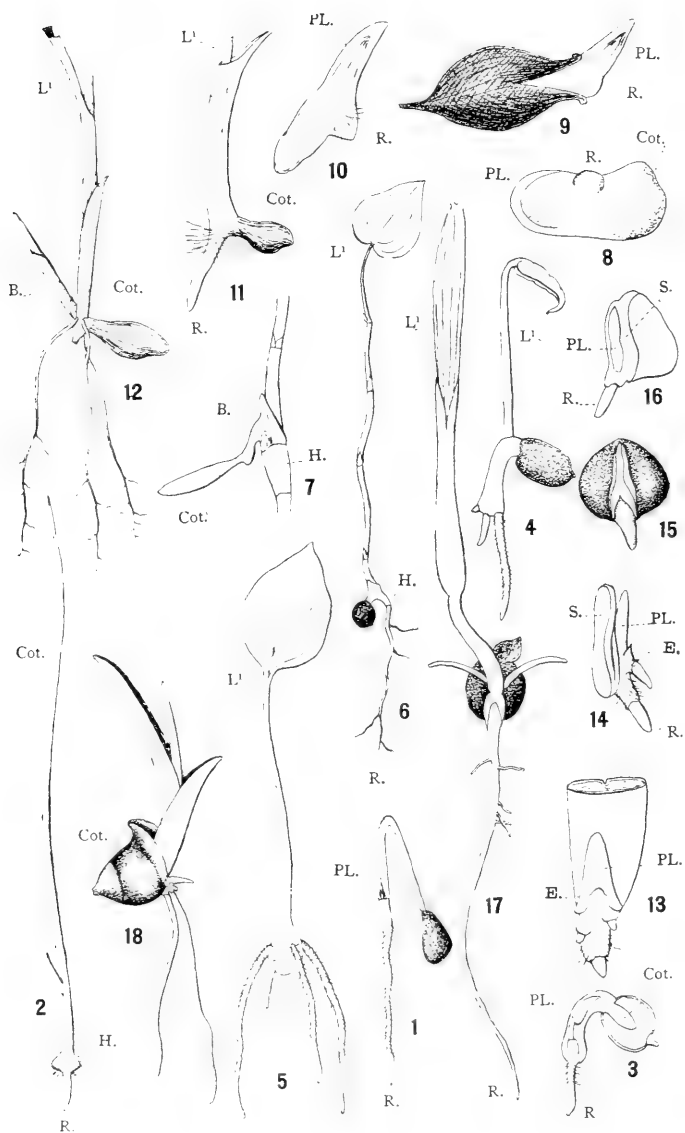
Turkey Point is a small marshy piece of land extending about two miles out into Long Point Bay, on the north shore of Lake Erie, some 40 miles south-west of Hamilton.—W. E. SAUNDERS, London, Ont.

UNUSUAL NESTING HABIT OF SLATE-COLORED JUNCŌ.—While at Armstrong's Point, Youghall, N.B., in July last, I was surprised to see a nest of the Slate-colored Junco, *Junco hyemalis*, built on a ledge beneath the gable of the house in which I was staying. When examined on July 20th, it contained two young birds, about half grown, and one old egg. The nest was situated about 10 feet from the ground and the house was partly surrounded by the edge of a spruce grove—ARTHUR GIBSON.

EXTENSION OF THE RANGE OF PERONYSCUS MICHIGANENSIS.—Some months ago I published an account of the taking of this mouse at Point Pelee. Subsequently Mr. John Morden found these in great numbers at the base of Point Pelee on the main land, so that one is led to expect them throughout the Lake Erie District of Ontario, but I was rather surprised on May 13th to find in my traps on the shore of Lake Huron several of these mice. The locality was about twenty-five miles east of Sarnia, just at the south-east corner of Lake Huron. The mice were inhabiting the beach in the same way that they lived at Point Pelee.

I have received from Mr. Norval Jones at Grand Bend, two more specimens of this mouse. Grand Bend is only fifteen miles north-east of the Point where I took the mice on May 13th, but the district is very northern in its characteristics. Crossbills are to be seen there during the summer, and the White-throated Sparrow and Olive-sided Fly-catcher spend the summer there, so that the range of this mouse in Ontario receives quite a northern aspect from these facts. In June, 1908, at the mouth of the Thames River in Lake St. Clair I trapped another of this species, and there is no doubt that it occurs all throughout the South Western Peninsula in considerable numbers.—W. E. SAUNDERS, London, Ont.

A BLACK-FRUITED THORN IN ONTARIO.—Mr. Frank Moberley, C.E., has sent down from Abitibi, specimens of black fruit of a *Cratægus*, presumably *Douglasii*, which Mr. James M. Macoun records as far east as Manitoba. I know of no black-fruited thorn having been previously found in Ontario.—J. FLETCHER.



SEEDLINGS OF PHANOGAMOUS PLANTS.

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OBSERVATIONS ON SEEDLINGS OF NORTH AMERICAN PHÆNOGAMOUS PLANTS.

By THEO. HOLM, Brookland, D.C.

(With three plates, drawn from nature by the author.)

There was a time when botanists were deeply interested in the study of seedlings and the subsequent development of the plant-individual from a morphological point of view. This was during the first half of the nineteenth century when Bernhardt, De Candolle, Mirbel, Richard, Tittmann and some others published their fundamental works on the germination, soon followed by Buchenau, Caspary, Irmisch, Warming, and Winkler, while Klebs and Sachs, but several years later, extended these morphological researches to the equally important and very interesting physiological. However, the literature on this subject may be followed still further back, and Malpighi was actually the first author who contributed to the knowledge of the germination of phænogamous plants; this may be seen from his works: *Anatome plantarum* (1675), *Opera omnia* (1687), and *Opera posthuma* (1697). To Ray we are indebted for dividing the plants into *Monocotyledones* and *Dicotyledones*, names invented by him, and described in his *Methodus plantarum* (1703). But, as stated above, it was not until the beginning of the nineteenth century that the study of seedlings became undertaken more generally and by some of the ablest writers on botany. In recent years, or let us say the last decennia, very few botanists have paid much attention to this particular question, and it is extremely little that has been brought to light by American writers. This is the more surprising since the American plants are exceedingly interesting from this point of view; moreover, it appears to the writer that the mere systematic treatment of the American flora is not sufficient so long as the younger stages of our plants remain ignored; the sad consequence is that the study of the organs of vegetative reproduction has been neglected to the same extent. It is only, at least in a number

of instances, through following the development of the individual from seedling to mature plant that the real structure of the subterranean stem-portions may be ascertained. The beginning of the formation of the rhizome, the location of the overwintering buds, the numerous modifications observable in the root-system, the structure of the foliage, etc., all these points deserve equally as much attention as the floral organs; they really deserve a place in the general diagnosis of the species. But it is a slow process to study and follow these various phases of plant life in nature, besides much literary research is involved.

Having been called upon to contribute a paper to the OTTAWA NATURALIST, I thought that it might be appropriate to present a brief sketch of some of the various types of seedlings which I have observed in this country, in the hope that some of the Canadian botanists might take the matter up and continue. At the same time I take the opportunity to insert some drawings which might serve to illustrate some of the characteristics of these seedlings; if sometimes too elementary, the text as well as the figures, I must ask for indulgence on the part of the reader.

Of the two large classes, of phænogamous plants, *Monocotyledones* and *Dicotyledones*, as proposed by Ray, the former germinate with a single, the latter mostly with two cotyledons; there are, however, several exceptions. In certain plants the seedling resembles a thallus, consisting merely of a globular mass of cellular tissue with no root, stem or leaf, as for instance in *Orchideæ*, *Monotropa*, *Orobanche*, etc., and finally among the *Dicotyledones* there are some cases where only one cotyledon becomes developed, the other being either rudimentary or totally wanting. But, common to both classes, when the germination begins the primary root is generally the first organ which appears, then follows the hypocotyl, and after this the cotyledons. Moreover, we find in both classes two types of cotyledons: above ground or epigeic, and subterranean or hypogeic; in the former of these, which is the most frequent, the cotyledons are leaf-like, green and thin, provided with stomata, and are thus able to assimilate: in the latter the cotyledons remain mostly enclosed by the seed; they are pale, fleshy, thick, and frequently grown together. These hypogeic cotyledons, especially characteristic of seeds without endosperm, are the bearers themselves of the reserve food-substance. In *Pinus* the cotyledons combine both types, since they at first serve as organs to absorb the endosperm, and subsequently become organs of assimilation; or the cotyledons contain some food-material and begin the function of assimilation as soon as

the reserve food is assimilated (several *Cruciferae*). Very peculiar is the structure of the cotyledon in several *Monocotyledones*, for instance the *Gramineae*, where a part of the cotyledon is developed as a flat, shield-shaped organ, the so-called scutellum, whose function it is to absorb the food-substances of the endosperm; a similar organ occurs, also, in Palms, *Commelinaceae*, *Canna*, etc., where it represents the apex of the cotyledon.

It is, therefore, very natural that the cotyledons exhibit a number of forms depending upon their function; beside that their varied position in the seed necessarily exercises some influence upon the outline of their leaf-blades. However, the cotyledons are not the only part of the seedling in which modifications as to structure and function may be observed; the primary root and the hypocotyl exhibit, also, some certain types of development, which are of no small interest. The root, for instance, may develop as a nutritive or a storage-root; or it may be the only organ by which the vegetative reproduction takes place in the first season, as in *Rhexia*. Finally, the hypocotyl may persist during the whole life of the plant or die off after the first season; it may persist as an ordinary stem, or develop as an organ for storing nutritive matters. It is, also, important to notice the position and vitality of the plumule; most frequently it gives rise to the main stem above ground, but not a few cases are known, where it stays under ground during the first year, developing into a rhizome; or, it lives only one season, after which it becomes replaced by buds from the axils of the cotyledons. In this way we must expect to find a rich illustration of biologic plant-types by merely examining seedlings; and, if we follow the successive development of these same seedlings, we are gradually led into that most interesting chapter of botany, which teaches us about the morphology of the shoot with its innumerable variations in respect to position and form of the vegetative and floral organs.

In the present paper I intend only to describe some types of seedlings during the first year of their growth, and we might begin with the *Monocotyledones*.

Characteristic of the seedlings of this class of plants is the presence of a single cotyledon, which may be epigeic or hypogeic, and the short duration of the primary root.

A very simple type is represented by *Agave* (Fig. 1). We notice in this that the primary root does not become arrested in its development so early as in most of the other *Monocotyledones*, but that it attains quite a considerable length; the cotyledon is thread-like and forms a sharp knee for penetrating the soil, while the apex remains enclosed in the seed until the endosperm has become absorbed; after that the apex of the

cotyledon becomes freed from the seed and stretches itself towards the light. The plumule is located at the base of the cotyledonary sheath and develops mostly only one green leaf during the first season. This manner of germinating is known, also, in *Sisyrinchium* and several *Liliaceæ*, for instance many species of *Allium*.

Another type may be observed in *Alisma Plantago*, L. var. *Americana* R. et S. (Fig. 2). So far as concerns the structure of the cotyledon, the seedling does not differ from that of *Agave*, but if we examine the root we notice that this remains very short, and that it bears a dense tuft of root-hairs at the base, where it passes into the more or less distinct hypocotyl (H). We have, thus, in this type of seedling an indication of a hypocotyl, and among other plants that exhibit this manner of germinating, and in which the seeds have no endosperm, may be mentioned *Butomus*, *Typha*, *Triglochin*, etc.; in *Juncus bufonius* the seeds contain endosperm, but the seedling shows, nevertheless, this same structure, according to Mirbel (1810).

We now proceed to a type of seedlings which is very frequent, and much more so than those described above; in this, the third type, the apex of the cotyledon remains enclosed by the seed in order to absorb the nutritive matters stored in the endosperm. Moreover, the free portion of the cotyledon constitutes a sheath of various length, at the bottom of which the plumule is located; the primary root attains sometimes a considerable length (Fig. 6), or it ceases to grow shortly after the germination has taken place (Figs. 3 and 4). As shown in Figure 7, a hypocotyl is developed, and this stem-portion is more distinct in this type of seedlings than in the former. In *Arisæma triphyllum*, Torr. (Fig. 3), the apex of the cotyledon is readily visible in longitudinal section, and is surrounded by the endosperm; the plumule with its first leaf is yet enclosed within the sheath, while the primary root is free, and provided with hairs. A more advanced stage may be seen in Fig. 4, where the leaf has broken through the sheath, and where two secondary roots have developed. During the first season the rhizome becomes formed by the growth in thickness of the short primary axis (Fig. 5), and attains the shape of a round tuber bearing three secondary roots, which rapidly increase in length, but without ramifying. In *Smilax rotundifolia*, L. (Fig. 6), we notice a long primary root, which stays active for at least one season, and the hypocotyl (H) in Fig. 7) is very distinct; otherwise the cotyledon shows the same structure as in *Arisæma*. The foliage of *Smilax* consists at the seedling stage of several minute, scale-like leaves preceding the green ones, of which mostly only one appears during the first season. It is interesting to notice that a bud becomes

developed in the axil of the cotyledon, and that this bud develops into a small tuber (B in Fig. 7). So far as concerns the structure of the cotyledon, its apex and short sheath, this type of seedling is common to many, *Liliaceæ*, *Amaryllideæ*, *Palmæ*, *Dioscoreaceæ*, *Irideæ*, etc.

A fourth type is characteristic of *Commelinaceæ*, and it differs from the former by the prolongation of the free part of the cotyledon, which here represents a long, filiform organ between the apex and the sheath; moreover, the primary root is surrounded by a sheath, the so-called coleorhiza, which it has to penetrate.

These four types thus illustrate the most frequent structure of seedlings of *Monocotyledones* excl., *Cyperaceæ* and *Gramineæ*, and the principal distinction consists in the position of the cotyledon, being epigeic or hypogeic; moreover, in the varied development of the cotyledonary sheath. In regard to the hypocotyl we have seen this to be well differentiated in *Smilax*, while it is either obsolete or undeveloped in the others. The primary root may persist for a longer or shorter period, but the most important character derived from this organ is the presence of a coleorhiza as observed in *Commelina*.

A feature common to these types is, however, that the root is the first organ to appear when the seed germinates; then follows the cotyledonary sheath, and finally the first leaf of the plumule. In this respect the *Cyperaceæ* make a notable exception from all the other *Monocotyledones* with perfect embryos. We might examine *Cyperus vegetus*, Willd., as an example of this type of germination, illustrated on Plate IV, Figs 8 and 11.

When the seed germinates (Fig. 9) the plumule surrounded by the coleoptile is the first to appear, pushing out through the opened base of the achene, and carrying with it the small root, merely visible as a minute wart. If we remove the cotyledon from the seed (Fig. 10), we notice the very simple structure of the embryo: the large clavate cotyledon, the sheath of which (coleoptile) covers the plumule completely, and finally the small root with a wreath of hairs. All these organs are, also, readily to be observed in the still younger embryo (Fig. 8) just before germination. The further development of these organs may be observed in Fig. 11, where the root has commenced to grow out, and where the coleoptile has attained its final shape: as a tubular leaf with a small, blade-like apex; no such advanced development of the coleoptile was observed in the other types described above. In the *Cyperaceæ* the coleoptile thus develops into a long sheath raised high above the plumule, and it turns its back toward the absorbing portion of the cotyledon. Sometimes, as for instance in *Fuirena squarrosa*, Michx., a long stem-like organ develops between the coleoptile and the enclosed portion of the cotyledon,

thus the coleoptile becomes situated at some distance from the cotyledon, as if it represented the first leaf of the seedling. If this be really the case we would have two leaves (cotyledon and coleoptile) situated at the same side of the axis, above each other, and such arrangement of leaves would not be very probable. A like structure is exhibited by *Rhynchospora alba*, Vahl. (Fig. 12), but in this the primary root does not develop at all, being replaced by three secondary roots. The structure of the cotyledon, however, is the same as in *Cyperus*; inside the coleoptile is the first green leaf from the axil of which a long bud has developed, provided with a small, adorsed fore-leaf, thus representing the first ramification of the young plant.

In the *Cyperaceæ* we have thus the same structure of the absorbing portion of the cotyledon, while the coleoptile is much further developed than in the third and fourth type described above. The generally adopted explanation of the coleoptile is that it merely represents the sheath of the cotyledon, and in cases where a stem-like organ is developed, in *Fuirena*, for instance, this organ is defined as a node, but as a node that has become unusually stretched. It deserves notice, however, that a root sometimes develops from this "node," while roots evidently but very seldom develop from the nodes, but from above or below these. The greatest difficulty by considering the coleoptile as an independent leaf, the first of the seedling, depends of course upon its position, since it is placed on the same side of the axis as the cotyledon; to overcome this difficulty some authors have expressed the opinion that a leaf is lacking, and this leaf should then be the small, lobe-like organ "epiblast" so very characteristic of certain genera of *Gramineæ*; this organ is in these situated opposite the cotyledon, and below the coleoptile, thus the arrangement of these three organs would correspond very well with that of normal leaves. But, so far, the epiblast has not been detected in any member of the *Cyperaceæ*.

Now, in regard to the *Gramineæ*, the structure of the embryo is very complicated, and has been the subject of an extensive literature from the hands of a number of the most notable morphologists. But so different are the views expressed that the only point which seems settled beyond doubt is that the *Gramineæ* have at least one cotyledon; some authors think they have two.

Let us, however, examine a few of these embryos before we review the various explanations that have been offered. On the accompanying plate (Plate IV) I have figured some germinating grains of *Secale* and *Zea* (Figs. 13-17), and in these we notice the following organs: the primary root (R) with its sheath, the so-called coleorhiza, and frequently accompanied by one or

several pairs of secondary roots (Figs. 13, 14 and 17); the so-called "scutellum" (S), which is more or less shield-shaped, and closely appressed to the endosperm, which it absorbs; furthermore, the small lobe-like organ called "epiblast" (E), which is situated opposite the scutellum, and which is not developed in *Zea*; between the scutellum and epiblast is the plumule (PL.) covered by a sheath, the so-called "coleoptile," which in *Zea* is borne on a stem-like organ of quite considerable length. The first green leaf of the seedling (L.) is to be seen in Fig. 17, having broken through the coleoptile. Considering the position of these three organs, scutellum stands opposite the epiblast, and the coleoptile is not only situated on the same side of the axis as the scutellum, but, furthermore, it turns like this toward the plumule, or let us say toward the first green leaf. In other words, in cases where the epiblast is suppressed, which is very commonly the case, the scutellum and coleoptile appear as two organs situated above each other, on the same side of the axis. The question then arises to define whether the cotyledon is represented by one or several of these organs, and whether these organs are really leaves, parts of leaves or independent leaves.

Strange to say, but according to Richard, A. de Jussieu, Hofmeister, and Sachs, the coleoptile should represent the cotyledon, while the scutellum and epiblast should merely be parts of stem and root. Another view was held by Schleiden, and Decaisne, who identified the scutellum and the epiblast as the cotyledon, the coleoptile as the first leaf succeeding this. Or these three organs may be defined as constituting the cotyledon, as proposed by Gaertner, who has been followed by Hegelmaier, Klebs, Van Tieghem (1872), Celakovsky and Schlickum; thus the scutellum should represent the absorbing portion of the cotyledon, the coleoptile its sheath, while the epiblast should be a mere protuberance of the coleorhiza (Schlickum) or a part of scutellum (Van Tieghem, Celakovsky); to this may be added that Van Tieghem, by means of the anatomical method, reached the conclusion that the stem-like portion between the coleoptile and scutellum is not an internode, but a node which has become unusually stretched.

Depending more on the mutual position of these organs than on their structure and homologies Warming has made a very different suggestion, and he considers scutellum alone as the cotyledon, the epiblast as the first leaf succeeding this, and the coleoptile as the second, thus presuming that the epiblast should actually have become completely suppressed in the *Cyperaceæ*; hence the peculiar position of the sheath just above the cotyledon in these. According to this same author the stem-like portion necessarily becomes an internode. The reason why Van Tieghem

would not recognize the epiblast as an independent leaf, was because he found no vascular system in it; however, in *Avena sativa* Didrichsen observed the epiblast to possess a very regular lobation corresponding with the presence of several mestome-strands. So far as concerns the internode, which Van Tieghem has declared to show the structure of simply a node, I must say, that in *Coix* for instance, the structure is very different from that of a node, but identical with that of an internode, and especially of a subterranean. In order to settle this question, whether this stem-like portion, by Celakovsky called "mesocotyl," be a node or an internode it is necessary to examine the internal structure in a larger number of genera, when it is fully matured; in *Coix* it is an internode, but it may not be constantly so in *Gramineæ* and *Cyperaceæ*. Furthermore the presence of a bud in the axil of the coleoptile, or according to Warming, in the axil of the second leaf succeeding the scutellum, speaks in favor of defining this leaf as independent of epiblast and scutellum. Such axillary buds have been observed in a number of genera of *Hordeæ*; beside that Van Tieghem observed them in *Avena*, and Bruns in *Bambusa*. The explanation offered by Warming seems so simple and readily to be understood, that it is undoubtedly the most natural.

In revising these various views we notice that there is one point, however, in which all these authors agree, namely, that the *Gramineæ* have only one cotyledon. We shall see now that there were formerly some authors who attributed two cotyledons to this family, the scutellum and epiblast, thus the *Gramineæ* should possess one large and one small cotyledon; these authors were Mirbel, Poiteau and Turpin. Recently Van Tieghem (1897) has abandoned his former theory, and adheres now to the views of these authors; in his new system he thus removes the *Gramineæ* from the other *Monocotyledones*, and places them among his "*Inséminées*." How untenable this classification is has been shown by Celakovsky, who calls attention to a fact, known long since, that in some genera of *Gramineæ* the seed is not grown together with the pericarp, but is free as in *Eleusine*, *Sporobolus*, *Crypsis* and *Heleochloa*, and these genera should consequently in accordance with Van Tieghem's system be separated from the other *Gramineæ*, and referred to his "*Seminées*."

The last type of monocotyledonous seedlings which may be described here is exhibited by *Peltandra undulata*, Raf. (Fig. 18). In this plant the fruit is a berry with a thin, almost black pericarp, and contains mostly a single seed with no endosperm. The seed is globular, surrounded by a tenacious jelly which, according to Baillon and Engler, is the transformed exterior integument of

the seed. The plumule is green and located in a furrow formed by the large cotyledon, the margins of which tightly enclose the plumule. The germination commences while the seed is still floating upon the water, and the first sign of the young plant is the plumule breaking out through the mucilaginous envelope and separating itself from the clasping margins of the cotyledon; the first leaf succeeding the cotyledon is exactly opposite this, and represents merely an open sheath-like organ with two ribs. This rudimentary leaf-structure may be frequently observed also in the second and third leaf of the seedling, while in some seedlings I noticed that already the second leaf showed a distinct petiole and a small elliptic blade. In regard to the root system, the primary root does not develop, but secondary roots in pairs appear at an early stage, and attain a considerable length, though without ramifying.

Orontium aquaticum, L. germinates in the same way, but the plumule is here located in a shallow cavity of the cotyledon without being surrounded by this. The first leaf succeeding the cotyledon is terete, not bicarinate, and this form of foliage becomes repeated in several of the following leaves; the primary root stays rudimentary, but soon becomes replaced by several lateral.

We have thus in monocotyledonous seedlings several interesting types, in which quite a prominent variation is noticeable in respect to the structure of the cotyledon, the first leaf or leaves succeeding this, and the root system. In some of these the seed is exalbuminous, and the cotyledon epigeic, as in *Alisma*; or we have the peculiar, globular cotyledon in the exalbuminous seeds of the aquatic *Orontium* and *Peltandra*. Epigeic is, furthermore, the cotyledon of *Agave*, but not until it has absorbed the food-substances of the endosperm. The hypogeic cotyledon is much more frequent, but varies in regard to the structure of the absorbing portion, for instance, if we compare the scutellum of the *Gramineæ* with the club-shaped cotyledon of *Cyperaceæ*, *Smilax*, *Commelina*, *Arisæma*, etc. Sometimes the cotyledon possesses a distinct sheath which envelopes the plumule, as in *Arisæma*, *Smilax* and *Agave*; if the coleoptile of the *Gramineæ* and *Cyperaceæ* might prove to represent the sheath of the cotyledon, this would then frequently appear at some distance above the scutellum, separated from this by an internode or node, according to some authors. The cotyledon may subtend a bud as in *Smilax*, and we remember that in several *Gramineæ* a bud has been observed in the axil of the coleoptile, whether this be an independent leaf or merely a part of the cotyledon. The foliage of these seedlings is, also, characteristic; for instance, the epiblast and coleoptile in

Gramineæ, the bicarinate leaves in *Peltandra*, the small, scale-like in *Smilax*, and finally the large, green leaf in *Arisæma* with petiole and blade. However, the structure of the first leaf succeeding the cotyledon does not always depend upon the presence or absence of an endosperm, for instance in the *Araceæ*. A hypocotyl is, sometimes, developed, as for instance in *Alisma*, *Agave* and *Smilax*. In regard to the roots we have seen the development of a coleorhiza in *Gramineæ*, *Cyperaceæ* and *Commelinaceæ*; furthermore, the relative strong growth of the primary root in *Zea*, in *Agave* and *Smilax*, but most frequently the root system consists of secondary roots replacing the early fading primary.

(To be continued).

EXPLANATION OF PLATE IV.

In the figures the letters indicate as follows:—

R, the primary root; Cot., the cotyledon; L1, the first green leaf; PL, the plumule; S, the scutellum; H, the hypocotyl; B, bud in axil of cotyledon (Fig. 7), or of the first leaf (Fig. 12); E, the epiblast.

- Figure 1. *Agave Americana*, L., natural size.
 " 2. *Alisma Plantago*, L., var. *Americana*, R. et S., x 8.
 " 3. *Arisæma triphyllum*, Torr., longitudinal section; x 4.
 " 4. Same, a little older; x 4.
 " 5. Same, still older, showing the first green leaf fully developed; natural size.
 " 6. *Smilax rotundifolia*, L.; natural size.
 " 7. Same, part of the seedling, removed from the seed; x 5.
 " 8. *Cyperus vegetus*, Willd., the embryo; x 75.
 " 9. Same, germinating seed, surrounded by the pericarp; x 26.
 " 10. Same, the seedling, removed from the seed; x 26.
 " 11. Same, a more advanced stage; x 18.
 " 12. *Rhynchospora alba*, Vahl., seedling; magnified.
 " 13. *Secale cereale*, L., germinating grain, seen from the front, but upper half of grain cut off; magnified.
 " 14. Same, seedling removed from the grain, side-view; magnified.
 " 15. *Zea mays*, L., germinating grain; natural size.
 " 16. Same, longitudinal section; natural size.
 " 17. Same, a more advanced stage; natural size.
 " 18. *Peltandra undulata*, Rafin., natural size.

BLUE BIRDS OF THE MARITIME PROVINCES.

By WM. H. MOORE, Scotch Lake, N.B.

As there seems to be a general misunderstanding among people in regard to our blue birds, *i.e.* birds having some blue in their plumage, it has occurred to me that a short paper on this subject might prove of considerable benefit, for at any meeting that the writer has addressed, about birds, this question has always come up. Especially among school teachers, and normal

school students, who are expected to take up Nature Study, and who have rare opportunities of observing the bluebird (*Sialia sialis*). there seems to be a trend of opinion that the blue jay (*Cyanocitta cristata*) may be the bluebird. At a recent meeting, when this subject was brought up, it was found that one normal student had seen an indigo bird (*Passerina cyanea*), one of our blue birds that is very rare in the Maritime Provinces. Another student knew of a bird that had blue upon the back, but had a brownish breast; as it was not blue all over, it was not thought to be the real bluebird. Others wished to know if the bluebird and blue jay were the same species. Without a doubt many people would be surprised to know that we have over a score of land birds with blue coloured plumage. In some of these the blue colour is decidedly noticeable, in others it is found only as bluish reflections in the breeding plumage. A number of the waders and water birds have blue in various hues, on different parts, but of these we shall not treat in detail. The birds we will refer to in comparing the size of the different species are the crow, robin, English or house sparrow, and the goldfinch or thistle-bird, all of which must be fairly well known to most Canadians.

SIALIA SIALIS, the real Bluebird. The male has the upper parts, wings and tail bright blue, tipped with rusty in the fall; throat, breast and sides chestnut or rufous; belly white. The female is paler throughout; the upper parts having a grayish tinge; the throat, breast and sides paler. Slightly larger than the house sparrow. The song of the male (if song it may be called) is a melodious *chee-er-ie* whistle. In the fall the call of both sexes is a soft and gentle *tur-wee*. For a nesting site a hole in a tree, or a hollow fence post is selected, and occasionally houses put up for martins are occupied by this species. The nest is composed of grasses, with the finer parts inside. Feathers are often used in the lining. The eggs are pale bluish, rarely pure white, and number from four to six. The period of incubation varies with the season; from fourteen to eighteen days. The food consists of insects of many kinds, which are sometimes caught in the air after the manner of the flycatchers. For a number of years the bluebird was very rare with us, but during the last five years it has become quite common. The principle enemies of the bluebird are small hawks, squirrels and domestic cats. This bird arrives from the south from early April until the last of May, and stays until well on into October.

SITTA CAROLINENSIS, the White-breasted Nuthatch. The adult male has top of head and fore part of back black; rest of upper parts bluish-gray; inner secondaries bluish-gray with black markings; middle tail feathers bluish-gray. Female similar but

the black of head and back is washed with bluish-gray. About same size as the house sparrow.

SITTA CANADENSIS, the Red-breasted Nuthatch. Adult male has upper parts and middle tail feathers bluish-gray; top of head and line through the eye black; a white line over the eye; throat white; underparts rufous. Female similar, but the top of head and stripe through the eye bluish-gray, like the back; under parts paler. Size smaller than the goldfinch.

These two species of nuthatch are similar in habits; their calls being the well known *yank, yank*, and various twitterings as they search for food among the tree-tops.

The erratic clamberings of these birds serve to distinguish them from any other of our feathered friends; creeping about on trees, head downwards, is characteristic of the species.

The nest is made in a cavity dug into a tree trunk, and is composed of fine shreds of bark, fur and feathers. The entrance to the cavity is always more or less smeared about with balsam gathered from fir trees. This is carried in the bird's bill and put in place, evidently to serve as a protection and keep out climbing mice and squirrels, as this substance would very much entangle the fur of these rodents. The eggs number from five to eight and are white with numerous brownish specks. The period of incubation is about ten to twelve days, and is engaged in by both birds. The food is chiefly insects, but probably seeds are also eaten to some extent. Both are permanent residents with us, and often come about buildings in search of flies hidden in crevices. They may also be seen about horse droppings along roads leading through wooded tracts.

Among the warblers we have several which show more or less blue in their plumage. In only one species, however, is the blue very noticeable.

DENDROICA CORONATA, the Myrtle Warbler, also known as Yellow-rumped Warbler. Adult male with a yellow patch on crown, rump and either side of the breast; upper parts bluish-gray with black streaks; two white wing-bars; throat white; breast and upper belly marked with black; lower belly white. Female similar, less plainly marked. About size of the goldfinch. This species is a common summer resident, frequenting mixed growths of young trees. This is our first warbler to arrive in spring, coming sometimes in April and staying until late September.

DENDROICA CÆRULESCENS, the Black-throated Blue Warbler. Adult male has upper parts grayish-blue; back sometimes blackish; wings and tail edged with blue; sides of head and throat black; breast and belly white; also a white spot on middle of closed wing. Female paler on upper parts; back olive-green,

the only blue being on the tail; underparts yellowish; white wing mark present though less noticeable than in male. This is our bluest warbler. Smaller than the goldfinch. Tolerably common in mixed woods, where its oft repeated *zee-zee-zee* song may be heard. They are present with us from early May until September.

COMPSOTHTYPIS AMERICANA, the Parula Warbler, or Blue Yellow-backed Warbler. Male with upper parts grayish; a yellowish patch on middle of back; throat and breast yellow; a black, or bluish black, or rufous, band across the breast. Female similar, but the band on breast sometimes lacking. The smallest of our bluish birds. A fairly common summer resident from early May until September. The nest is a beautiful hanging basket of *Usnea* moss.

HELMINTHOPHILA RUFICAPILLA, the Nashville Warbler. Male with bluish-gray on top and sides of head; a chestnut patch on crown; under parts bright yellow, whiter on belly. Female, colours rather duller than those of male. Tolerably common in moist, bush grown pastures and similar places. Smaller than the goldfinch. Nests upon the ground.

VIREO SOLITARIUS, the Blue-headed Vireo. Top and sides of the head bluish-gray; eye-ring and lores white; two white wing-bars; underparts white. Slightly larger than the goldfinch.

Probably more common than is generally supposed, the song being mistaken for that of the Red-eyed Vireo. There is no reason to be misled, however, as the songs are quite different, that of this blue-headed species being louder and clearer than that of his red-eyed relative. The vireos build hanging nests, thus gaining for themselves the name of hangbirds. This blue-headed, or solitary vireo, is with us from late April until October.

We come now to the swallows, a group of birds with blue in the plumage, but none of which need be mistaken for blue-birds. Excepting the tree swallow, this group of birds may all be found about buildings. Even that species sometimes nests in bird-houses supplied by mankind. All are insectivorous.

TACHYICINETA BICOLOR, the Tree Swallow, or White-bellied Swallow. Both sexes are alike; upper parts steel blue or steel-green; under parts white; outer tail feathers longer than middle ones. Between the goldfinch and the house sparrow in size, but having long wings, which make it appear larger when flying. A tolerably common summer resident from the middle of April until the middle of July. The nest is situated in bird-houses, holes in trees and hollow fence poles and is composed of fine grass blades, lined with feathers.

CHELIDON ERYTHROGASTER, the Barn Swallow, also called Forktail Swallow. Sexes similar; forehead, throat and upper

breast chestnut-rufous; rest of under parts washed with same colour; upper parts steel-blue, tail deeply forked. Body about the size of that of the goldfinch; the long tail feathers give a length to the bird greater than the sparrows. This swallow nests inside buildings, but in a few instances has been known to build outside. It is with us from late April until September.

PETROCHELIDON LUNIFRONS, Cliff or Eave Swallow. **Adults** with steel-blue crown, back and centre of breast; forehead whitish; throat and sides of head chestnut; tail feathers of nearly equal length. Midway in size between the goldfinch and the house sparrow. This is the swallow that builds nests under the eaves of buildings, and is our most abundant kind. It is with us from early May until the middle of September.

PROGNE SUBIS, the Purple Martin. Male shining bluish-black, with wings and tail duller. Female with upper parts bluish-black; throat, breast and sides grayish; belly white. Size between the house sparrow and the robin. Nests are made of straw and twigs built in small bird-houses. Least common of any of our swallows. It is here from late April until August.

PASSERINA CYANEA, the Indigo Bunting, or Indigo-bird. Male, rich blue, deeper on the head, brighter on the back; wings and tail black, edged with blue; lores blackish. Female of a grayish brown, the wings and tail only showing bluish. Slightly larger than the goldfinch. The size alone would serve to distinguish it from the bluebird. The song also is very different, it reminding one somewhat of the purple finch trying to sing like a goldfinch. Then the Indigo-bird is so rare with us that there is little likelihood of confounding the two species.

We come now to some species of black birds having bluish reflections none of which need be mistaken for the bluebird, as all are larger.

QUISCALUS QUISCULA ÆNEUS, the Bronze Blackbird, or Crow Blackbird. Larger than the robin. Very common from April to October.

SCOLEOCOPHAGUS CAROLINUS, the Rusty Blackbird. Male in spring plumage glossy bluish-black; at other seasons, feathers tipped with rusty. Female without bluish gloss; more rusty than male. Slightly smaller than the robin. Tolerably common from April to October.

CYANOCITTA CRISTATA, the Blue Jay. Upper parts blue; under parts white, washed with dusky on the sides; black patches on wings, tail and about the head and breast; head crested. Larger than the robin. A common permanent resident. Mimics other birds, as Broad-winged hawk and woodpeckers, in its calls. A beautiful bird, and one that is most cautious during the breeding season. The nest in this section is built in tall trees in the forest.

It is difficult to conceive of this bird nesting in the back yards of houses as it does in some localities. It is also quite as difficult for people of the south and west to realize the Blue Jay being so retiring during the breeding season, as it is here in the Maritime Provinces.

CERYLE ALCYON, the Belted Kingfisher. Male with upper parts bluish-gray; numerous white spots on the wings; throat and sides of neck and belly white; sides bluish-gray, also a band of same colour across breast. Female similar, but the band on breast and sides rufous. Both sexes crested. Larger than the robin. Tolerably common from April until October. One recorded at Sussex, N.B., as late as Christmas Day. As the name implies, this bird is a fisher, living upon small fish, crayfish and larvæ of various species of insects, that pass part of their lives in the water. This species nests in tunnels burrowed into banks of streams, and other suitable places. The eggs are beautifully white, four to seven in number; incubation beginning about when the first egg is laid, as broods of young show different sizes. The rattling call of the kingfisher is its most distinctive characteristic.

These are our birds having some blue in their plumage, none of which, however, need be mistaken for our real Bluebird, *Sialia sialis*, having, as Burroughs says, the blue of the sky on its back, and the brown of the earth below.

IS RHUS GLABRA IN CANADA?

By EDWARD L. GREENE, U.S. NATIONAL MUSEUM,
WASHINGTON, D.C.

Certainly all the descriptive botanies, and almost all the lists and catalogues that have been written as for Canadian territory, affirm that *Rhus glabra*, Linn., grows there. But then, the affirmation may have been in every instance unwarranted. Despite all the books and catalogues, it may be that no such shrub as that name stands for, and must stand for, is found on Canadian territory. It is easily possible that every such book and catalogue may, in this particular, be wrong.

Now, let us permit no misunderstanding as to what our question really is. It is not doubted that in the Canadian flora there occurs in several places what all have called *Rhus glabra*. But, they write "*Rhus glabra*, Linn.," and that is saying that the particular kind and description of sumach to which Linnæus assigned that name is there. It is this often repeated assertion that Linnæus' *Rhus glabra* is in Canada, which is here

called in question, That is an affirmation which never could have been warranted, but as the result of a certain piece of phytographic investigation, which investigation it is probable no one, studying Canadian botany, has yet undertaken. For example: has any one with the so-called *Rhus glabra* before him betaken himself to the original Linnæan account of the shrub, to see if it answered to that account?

To come nearer home, I do not believe that any one in New England has ever yet gone into the history and description of *Rhus glabra* far enough to determine whether or not there exists in all New England any shrub answering to Linnæus' *Rhus glabra*. The easy thing to do is what the great majority of botanists do, whether of New England, of Canada, or elsewhere, and that easy thing is, simply to follow some one else's dictum; take the authority of some other author, and accept that, without a moment's thought as to whether it may be right or wrong; even never doubting that it is right.

Such a course as this is as far as possible from being scientific; yet, as I have said, it is the usual course. It is the easy way, albeit an utterly irresponsible way; a way that leads to the making of books and catalogues that, instead of being truthful, reiterate and disseminate and perpetuate a hundred errors, it may be, on every fifty pages.

I have taken up this case of *Rhus glabra* chiefly as being illustrative of the easy irresponsible way that many botanists—not those of Canada any more than those of a hundred other regions—accept and reprint old names as applied to new plants.

Linnæus did not himself describe his *Rhus glabra*, but cited a fine description that was already before the public, that of the great Dillenius. To this author, then, we must go, if we are to ascertain what the *Rhus glabra*, Linn., is like.

Dillenius (*Hortus Elthamensis*, p. 323, b. 243) has a folio plate, accompanied by almost a folio page of description, so that we have no great difficulty in ascertaining both what the original *Rhus glabra*, Linn., looks like, and what is its native region. He attributes to his shrub a foliage made up of from 21 to 25 leaflets, each leaflet nearly 2 inches wide and 6 inches long or more. This is making the individual leaf of real *Rhus glabra* to be more than two feet long. Neither in Canada, or in any part of New England adjacent to Canada, is there any *Rhus* heard of as having foliage of anything approaching such dimensions, or of such a great number of leaflets. And the originals of Dillenius—therefore of Linnæus—were from a very different region, namely southern Virginia. This, the genuine *Rhus glabra*, Linn., of which one of the specific marks is its very large foliage, is found all up and down the country lying south of

the Appalachian divide between Virginia and Long Island. If by any magic a clump of this shrub should be transferred to western New York, or across into Ontario, and set down adjacent to the so-called *Rhus glabra* of those regions, the first botanist who came upon it, seeing the wonderful contrast in foliage, would be likely to suspect that in this *Rhus* of such enormous foliage he had a new species. The shrub of the regions north of the Alleghenies has never two-thirds as many leaflets, and these never nearly as large, so that its leaf, as a whole, is not of half the size—certainly seldom as much as half as large—as that of the real Linnæan *Rhus glabra*. It is as common from Ithaca, New York, to the vicinity of Boston, Massachusetts, as *Rhus glabra* genuine is in Virginia, southern Pennsylvania and New Jersey; and these marks of the leaves are not all. Let us place the two shrubs in closer contrast descriptively. The one of the North, copious about Ithaca, and extending into Ontario, we will call *Rhus Ithacensis*.

Rhus glabra.

Leaf as a whole commonly 2 feet long.

Leaflets 17-25, rounded at base, 4-6 inches long, of hard firm texture.

Fruiting panicle with very short, stout peduncle.

Panicle itself between fusiform and pyramidal, commonly 10 inches high; drupelets large.

Leafy branches of shrub quite blue with bloom.

Rhus Ithacensis.

Leaf as a whole usually 7-11 inches long.

Leaflets 11-17, abruptly tapering at base, 2½ or rarely 3 inches long, of thinner texture.

Fruiting panicle with long peduncle and not stout.

Panicle oblong-fusiform 4½-6 inches high, the drupelets smaller.

Leafy branches much more slender merely glaucescent.

If such marked distinctions exist between the northern smooth sumachs and the southern, then, in the name of science, not to say of common truthfulness, the expression "*Rhus glabra*, Linn." should early disappear from the books and lists of Canadian plants. No kind of procedure is more subversive of knowledge than that of transferring the name of one object, to another object very unlike that to which alone the name by right belongs.

I conclude by repeating it, that this *Rhus glabra* case is but illustrative of a certain principle. Under that revival of interest in North American botany that is now in progress, old and deeply rooted errors about the identity of things are being perfectly indicated, and the amendments of them made, by the score every year, but curiously, the botanists are of two classes, those who welcome the fuller knowledge, and those who deplore and oppose it.

ZOOLOGICAL NOTES FOR 1908.

BY J. F. WHITEAVES.

Among the additions to the zoological collections in the Museum of the Geological Survey for 1908, there are three specimens that seem to be of sufficient interest to warrant a permanent record. These are as follows:—

MAMMALIA.

(1) PUTORIUS RIXOSUS, Bangs.

(*Least Weasel*; *Bangs' Weasel*).

A weasel, that corresponds very well with Mr. Bangs' description of this diminutive species, was obtained by Mr. Joseph Keele in January, 1908, at Third Lake, on the Ross River, Yukon Territory, in Long. 131°W., and Lat. 62° 45'N. The specimen, which was caught in a marten trap, is in full winter fur, and was said by the trapper to be a male. It is remarkable for its extremely small size, its fur is pure white, and its tail is short and white at the tip. It was received in the condition of a well prepared skin, with the skull, and has since been mounted for exhibition. Following the curves of the head, neck, back and tail, it now measures roughly 172 mm, or slightly less than 6¾ inches, from the nose to the tip of the tail; or about 5¾ inches, if measured in a straight line.

The type of *P. rixosus*, Bangs, 1896 (Proc. Biol. Soc. Washington, Vol. x, p. 21), is an adult female from Osler, Saskatchewan; and the species is known to occur also at the mouth of the Porcupine River, Alaska; on the upper Yukon; at Fort Albany, and at Moose Factory.

This species is the smallest weasel known, and the only American one that lacks the black tip to the tail.

(2) SYNAPTOMYS (MICTOMYS) WRANGELI, Merriam.

(*The Alaskan Lemming Mouse*).

A specimen of this species, was presented to the Museum of the Survey by the Rev. J. H. Keen, of Metlakatla, B.C., in October, 1908. This interesting little rodent was caught by Mr. Keen at Metlakatla on the second of November, 1899, and is the first specimen of this species that has been received in Ottawa. The specimen is a skin, with the skull, and the label that accompanies it states that it is a male.

The exclusively North American genus *Synaptomys* was constituted by Dr. Spencer F. F. Baird, in 1857, in his "Mammalia

of North America," for the reception of two specimens of a small rodent which has all the external appearance of a field mouse or vole, but which has the teeth of a lemming. As its name implies (*sūn*-*apto*, to join together; and *mūs*, a mouse) the founder of the genus supposed it to be a connecting link between the field mice and the lemmings.

In 1896, in a paper on "The Genera and Subgenera of Voles and Lemmings," published by the U.S. Department of Agriculture, Mr. Gerrit S. Miller, Jr., says that *Synaptomys* is a true lemming, and that it differs from all the other genera of *Microtinae* by its grooved incisors.

A little earlier in the same year, Dr. Merriam, in a "Revision of the Lemmings of the genus *Synaptomys*," published in the tenth volume of "Proceedings of the Biological Society of Washington," had divided the genus into two subgenera, viz.: (1) *Synaptomys* (proper). Baird, 1857; and (2) *Mictomys*, True, 1894. The first of these subgenera is said to be represented by "four fairly well defined forms." and the second by "at least four species."

The only species of the subgenus *Synaptomys*, as defined by Merriam, that has yet been found in Canada is *S. fatuus*, Bangs (the "Northern Lemming Mouse"). The type and eight cotypes of this species were collected "about Lake Edward," P.Q., by Mr. Bangs in 1895, and specimens of it are recorded as having been collected at Godbout, P.Q., by Mr. Napoleon Comeau in the same year; and at two localities in New Brunswick by Dr. J. A. Allen in 1894.

Of the subgenus *Mictomys*, two species are now known to occur in Canada. These are (1) *Synaptomys (Mictomys) inimitus*, True, which is the Lemming Mouse of Ungava; and (2) *Synaptomys (Mictomys) Wrangeli*, Merriam, which is the Lemming Mouse of Alaska. The first of these species was described in 1894, and was based upon a specimen collected by Mr. Lucien M. Turner at Fort Chimo, near Ungava Bay, which is still the only locality at which this species has been collected.

The second was described in 1896, from two specimens collected in 1895 by Mr. Clarke P. Streater at Wrangel, Alaska. Mr. Keen's discovery of specimens at Metlakatla extends the southern range of this species to the coast of British Columbia.

BIRDS.

(3) CERATORHINA MONOCERATA (Pallas) Cassin.

(*The Rhinoceros Auklet*).

A good specimen of the single egg of a pair of birds of this species, from Lucy Island, near Metlakatla, was presented to

the Museum of the Survey by the Rev. J. H. Keen in December, 1907, as stated in the OTTAWA NATURALIST of that date.

In October, 1908, Mr. Keen kindly presented the same museum with a fine specimen of a bird of this species, which is labelled as having been taken at Lucy Island on the 24th of April, 1907.

The specimen is a skin of an adult male, in spring plumage, which shows well the large upright and deciduous "horn" at the base of the upper mandible, and the two longitudinal series of long, narrow and acutely pointed white plumes, on each side of the head, as figured by Coues on page 1067 (fig. 722) of the second volume of his "Key to North American Birds."

This large and remarkable species of Auklet has long been known to have a very wide distribution in the north Pacific, but it was previously represented only by an egg, in the Survey collection.

DIOSCOREA VILLOSA AT SARNIA.

By W. A. DENT, Sarnia, Ont.

The surface of the land about the shores of Lake Huron in the vicinity of Sarnia is a succession of sand ridges parallel with the lake. Many of the depressions between these ridges were formerly swampy, or actually covered to a slight depth of water. Vegetable remains accumulated in these depressions in many places to a considerable depth, forming a soil almost as black as charcoal. This humus, mingled with the sand and receiving the drainage from the surrounding ridges, forms an almost ideal soil for the growth of many comparatively rare and interesting plants. The orchid family, renowned for the beauty of its flowers, was here formerly abundantly represented by many of its most beautiful members. *Arethusa*, for instance, *Calopogon* and *Pogonia*, that dainty trio, here grew in profusion, while the *Cypripediums* in millions made the swamps gorgeous. *Cypripedium spectabile* was formerly so abundant that men went with wagons, and gathered loads of the blossoms to ship to larger centres. *C. candidum* is still to be found in comparatively large numbers, while boquets of *C. arietinum* grace the teachers' desks regularly in several country school-houses.

That beautiful violet, *Viola pedata*, with flowers an inch across, and of the richest shade, grows beneath the pines on the sheltered banks of the sandy ridges.

In the thickets, which are abundant in these shallow ravines, many twining plants grow in tangled masses, sheltering partridge,

quail, woodcock and rabbit, and affording nesting sites to innumerable thrashers, veeries, chewinks, catbirds and rose-breasted grosbeaks. One of the most interesting of these twiners is the Wild Yam, *Dioscorea villosa*, whose knotted root-stocks in many places lie thickly matted a few inches below the surface. It is a graceful, slender twiner with heart-shaped, pointed leaves and small greenish-yellow flowers. The fruiting capsules are conspicuous in drooping racemes, persisting after the leaves have fallen. The plant seems to be restricted to a few of these block-soiled ravines, but, in those in which it does grow, it is the most abundant of the twiners. The soil in which it grows is so light that the root-stocks of the *Dioscorea*, as well as the roots of many shrubs and brambles, are readily removed without the aid even of a trowel. Its stems are frequently intertwined with those of *Celastrus*, *Smilax herbacea* and *S. rotundifolia*, while *Euonymus Americanus* covers the ground, its crimson pods with their scarlet arils being highly ornamental in the autumn.

Dioscorea villosa is reported as being rare in Ontario. The writer would be glad to hear through THE OTTAWA NATURALIST, or otherwise, of its occurrence elsewhere.

NOTES.

In the removal to Toronto of Dr. S. B. Sinclair, late Vice-Principal of the Normal School, the Club loses from the ranks of its active membership one who, for a number of years past, has taken a keen and enthusiastic interest in our work. It is almost entirely due to Dr. Sinclair that the happy and important relationship that exists between the Club and the students of the Normal School to-day, has been brought about. He has placed before each successive class the benefits to be derived from our excursions and lecture courses and taken no small part in helping the Executive to make these occasions of real value to his students. It would be hard to over-estimate his influence on these future teachers in our Public Schools, in thus awakening and encouraging in them a love for Nature Study.

It is not only in this good work that Dr. Sinclair has taken an active part. For many years he was our Librarian and for several terms our esteemed President, directing and assisting in a most helpful way in all matters that served to promote the objects of the Club in this city. We shall miss greatly his genial, stimulating presence from our gatherings, and it is with much regret that we part with him as our coadjutor. Our best wishes

go with him for a very large measure of his success in his new sphere of action.

ENTOMOLOGICAL SOCIETY OF ONTARIO. The 45th annual meeting of this important society was held at the Ontario Agricultural College, Guelph, on November 5th and 6th. The meeting was a most successful one and much interest was shown in the various papers read at the different sessions. The whole of the first afternoon was taken up in a discussion of the chief insect pests of the season, fruit insects being specially treated of. At the first evening meeting Dr. E. P. Felt, New York State Entomologist, of Albany, delivered a splendid lecture on "The Interpretation of Nature." This was illustrated with particularly good slides. At the second evening meeting Rev. Dr. Fyles, of Levis, Que., in his own charming manner, spoke on "The Farmers' Woodlot"; Prof. W. Lochhead, of Macdonald College, on "What the Fruit Grower and Farmer should know about Entomology" and Rev. Prof. Bethune on "Injurious Insects in Ontario in 1908." At this meeting too, a paper on "The Present condition of the work connected with the importation of foreign parasites of the Gypsy and the Brown-tail Moths," by Dr. L. O. Howard, of Washington, D.C., was read. Besides Prof. Lochhead and Rev. Prof. Bethune, other members of the Ottawa Field-Naturalists' Club who attended the meeting and contributed papers were: Messrs. C. W. Nash and J. B. Williams, of Toronto; H. H. Lyman, of Montreal; F. Morris, of Port Hope; and Arthur Gibson, of Ottawa. Mr. J. D. Evans, of Trenton, was unable to attend the meeting, but sent two very interesting papers which were read. The Entomological Society of Ontario is doing splendid work in Canada. It has five active Branches, viz: at Quebec, Montreal, Toronto, Guelph and Victoria. A full account of the proceedings of the above meeting will be found in the annual report of the Society which will soon be published.

THE OCCURRENCE OF THE AMERICAN WOODCOCK (*PHILOHELIX MINOR*) IN MANITOBA.—On August 10th, while hunting insects in an old river-course—now a partially dried slough—near Westbourne, Manitoba, Mr. H. E. Chaplin, of Roland, and I were surprised at flushing a bird which we instantly recognized as the Woodcock. A few minutes' search was rewarded by finding the characteristic holes made by the bird, but no other Woodcock was seen. On mentioning the incident to Mr. Fred Rhind, of Westbourne, he told me that some twenty years ago a number of Woodcocks had been shot about the same spot we had seen the bird, but that of late years they had not been noticed. He also stated that in 1902, or 1903, Woodcocks were

very plentiful near his ranch at Big Point on the south-west shore of Lake Manitoba, it being no uncommon thing to flush six or more from around any little damp spot in the woods.

J. B. WALLIS, Winnipeg, Man.

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THE FLOWERING-RUSH. In reference to a very interesting communication by the late Dr. James Fletcher in THE OTTAWA NATURALIST for July (p. 80), I am glad to report that the Flowering-rush, *Butomus umbellatus*, grows in this locality also. It was seen in July, 1906, on the inlet from the Canal near the end of Bank Street, opposite the residence of Mgr. Sbarretti. I supposed it was merely an escape from cultivation, probably from the Experimental Farm, and did not report it. This year the number of plants had increased and were spread over a larger area.

E. H. BLACKADER, Ottawa.

A WOODPECKER AT A SHOW. During the progress of the Annual Provincial Exhibition at Victoria, B.C., in the last week in September, a Woodpecker of the Flicker variety, took up his abode in the main exhibition building. Here he made himself fully at home, quite fearless apparently of the multitude of visitors who were continually passing through the building, flying from point to point with the utmost unconcern and in spite of the printed warnings, and without the fear of the watchful attendants, he distributed his favours most impartially by helping himself to the choicest apples, pecking holes in all and sundry, within a few feet of the hundreds who witnessed his depredations.

The propensity of this bird to forsake his natural food and take to fruit during the autumn in the Province of British Columbia is well known, but this is the first instance within my knowledge when he went so far as to visit a show to satisfy his appetite.

J. R. ANDERSON, Victoria, B.C.

THE EARLY WAKE-ROBIN. In the spring of 1907, a box of the Mayflower, *Epigaea repens* was sent here from Massey, Algoma, containing a few other plants one of which was a Trillium with root which was planted. On the 15th of March, 1908, it came into bloom with the earliest crocuses in the garden, and proved to be the Early Wake-robin, *Trillium nivale*, Riddell, the first record of its being found in Canada.

W. HERRIOT, Galt, Ont.

SQUIRREL EATING A BIRD. I observed last summer at Angers, Que., in a garden, a common squirrel eating a bird. I chased the animal from tree to tree, but it did not release its prey until it was struck with a long stick. The bird was a young sparrow, although I think it was old enough to fly. It was still warm when I picked it up and the inside of its body was completely eaten. The fact seems to be peculiar as it occurred at a season when fruits, and other squirrel food, are plentiful, and I have never noticed in any scientific reports at hand that squirrels become carnivorous. I would be interested to know if any other naturalist ever saw anything of this kind.

GEO. MICHAUD, Ottawa.

In the October number of the Ottawa Naturalist in his "Notes on the Species of *Phæocyma* found in Canada," Dr. J. B. Smith stated that he had just finished a revision of all the American forms. This monograph "A Revision of some species of Noctuidæ heretofore referred to the Genus *Homoptera*, Boisduval," has just been published, (Proc. U. S. Nat. Museum. Vol. XXXV, pp. 209-275). This treatise which deals with a group of moths, the members of which have been much confused in collections, will be welcomed with delight by lepidopterists. We are deeply indebted to Dr. Smith for this valuable publication.

It is with very great regret that we have to record the death of Dr. James Fletcher, Entomologist and Botanist of the Dominion Experimental Farms, which occurred at the Royal Victoria Hospital, Montreal, on November 8th, 1908, in his 57th year. The Ottawa Field-Naturalists' Club, of which he has been styled "The Father," loses, in his demise, one of its most brilliant and active members. The January issue of the OTTAWA NATURALIST will be a memorial number, and will contain articles on him and his work by prominent members of the Club.



James Fletchery.

JAMES FLETCHER, LL.D.

MEMORIAL NUMBER

Tributes by Mr. A. E. Attwood, Lt.-Col. Wm. White, Dr. W. Saunders, Mr. W. H. Harrington, Mr. R. B. Whyte, Mr. Arthur Gibson, Prof. John Macoun, Dr. H. M. Ami, Mr. F. T. Shutt, Rev. G. Eifrig, Mr. E. R. Cameron, Mr. T. J. MacLaughlin, Mr. W. J. Topley and Dr. S. B. Sinclair.

NOTE—This Memorial Number has been edited by a Committee specially appointed by the Council of the Club and consisting of Mr. Arthur Gibson (Acting Editor), Mr. W. H. Harrington and Mr. F. T. Shutt.



THE OTTAWA NATURALIST

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OTTAWA, JANUARY, 1909

No. 10

JAMES FLETCHER, LL.D.

As mentioned in the December number of THE OTTAWA NATURALIST, it is with great regret that we have to record the death of our very dear friend Dr. James Fletcher, which occurred at the Royal Victoria Hospital, Montreal, on Sunday morning, November 8th, 1908. There are many sad hearts among the members of the Ottawa Field-Naturalists' Club, owing to the demise of him who has been styled its "Father". For the past three years his health had been gradually changing, and becoming undermined by intermittent hemorrhages resulting from a malignant tumour which caused his death. Four years ago, when, with the writer and some others, he was tobogganing near his home at the Experimental Farm, he met with an accident which confined him to his house for two months. Since then he often said that his health was not what it was before, and it may be that the trouble which brought his useful life to a close had its origin then. During the last year particularly he suffered much, at times, but his was not the nature to complain, and very few, even of his more intimate friends, really knew that his life was undergoing a serious change. The writer, who was constantly associated with him in the official work of the Division of Entomology and Botany knew what aches and pains he bore. Often, especially of late, as we were working together he would say that his head was thumping as if it would break, but it was only during such attacks towards the end of the afternoon that he would say he would have to stop and get away from the office.

On Thursday afternoon, October 29th, he left Ottawa for Montreal, to consult a specialist, saying that he would be back again on Saturday, or Monday. On November 1st the writer received a letter from him with regard to the annual meeting of the Entomological Society of Ontario, in which he said: "I find it is no use, I cannot get to the meeting. In fact, I only got here just in time. I shall probably not be back for another fortnight at least....." On the following day he wrote again saying: "I am very comfortable, everything so far is going well," and,

referring to the eggs of a rare butterfly which had been sent to him, he said: "The eggs of *Dorcas* are in my cellar in a black cardboard box, you had better get track of them." He asked me to acknowledge these eggs saying that he would write himself in a week or so. This was the last letter from him which we received at the Division.

It was decided soon after his arrival at the Royal Victoria Hospital that he would have to undergo an operation, but, owing to the serious nature of this, it was delayed from time to time, hoping that he would get stronger. This he did not do, however, and the operation had to be performed on Saturday, November 7th. Owing to his very weak condition, he failed to rally and died the next morning. During the whole time he was in the hospital he was very happy and had no fear whatever of the result of the operation. Even here he was looking forward to the near enjoyment of larger quarters for his Department, and of further help to carry on the important work about which he knew so much and which he did so well. The funeral was held on Tuesday, December 10th, from his residence at the Experimental Farm, to St. Barnabas' Church and thence to Beechwood Cemetery.

The Rev. Professor Bethune, in the *Canadian Entomologist*, December, 1908, has expressed our feelings so well when he says: "Few men ever made so many loving friends in all walks of life; every one who came to know him did not fail to become warmly attached to him. There are many sad hearts grieving at his loss all over the Dominion of Canada, and many too in widely scattered places in the United States. Old and young, rich or poor, learned or ignorant, children and their elders, it made no difference—he had a kindly word for each one, and most can treasure in their memories a kindly deed as well. When he addressed a meeting he captivated his audience at once, and when he joined an excursion of nature students all were eager to be with him, and learn from him some of the secrets of the woods and fields that he knew so well. We shall not see his like again, but we may all feel that it was good for us to have known him—his memory will long live in our hearts—his noble words and generous deeds will be happy recollections for many a year to come."

Dr. Fletcher was born at Ashe, in the County of Kent, England, on March 28th, 1852. He was educated at King's School, Rochester, and came to Canada in 1874 as a clerk in the Bank of British North America. Two years later he left the bank and became an assistant in the Library of Parliament, Ottawa. All his spare time he devoted to entomology and botany and soon became a recognised authority not only on these subjects but on other branches of natural history as well.

While he was continually busy with his official work, he yet found time for many other things. He was a loyal member of the Church of England and a generous supporter of all her works. He attended St. Barnabas' Church, of which at the time of his death he was a warden. His special aptitude for teaching and his love of children made him an ideal Superintendent of the Sunday School, in Holy Trinity Church, Ottawa East. In this capacity he acted for over twenty years, seldom missing a Sunday when he was in Ottawa. He was an active and enthusiastic member of the Brotherhood of St. Andrew, a member of the Board of Governors of St. Luke's Hospital, and a member of the Rideau Club.

At a meeting of the Council of the Ottawa Field-Naturalists' Club, held on November 10th the following resolution of condolence was passed: "The members of the Council of the Ottawa Field-Naturalists' Club desire to place on record their profound sorrow and sense of deep personal loss in the death of Dr. James Fletcher, and to express their sincerest sympathy to his widow and family in their bereavement. Dr. Fletcher was one of the founders of the Ottawa Field-Naturalists' Club which is now nearly 30 years old. It is peculiarly sad that he, who was so often referred to as the 'Father' of the Club, should be the first member of the original council to be removed from our midst."

At this meeting it was decided to hold a Memorial Meeting in the large assembly hall of the Normal School.

ARTHUR GIBSON.

MEMORIAL MEETING

DECEMBER 1ST, 1908.

The President of the Club, Mr. A. E. Attwood, M.A., in asking Lieut.-Col. Wm. White, C.M.G., to act as Chairman for the meeting, spoke as follows:

Members of the Ottawa Field-Naturalists' Club and friends of the late Dr. Fletcher:—It has been a time-honoured custom of the Ottawa Field-Naturalists' Club to begin their series of winter soirées with an evening's programme somewhat informal in its nature. The sudden death of the member who was one of the founders of the Club has rendered it appropriate to make a change this year at our initial soirée. It is hoped, however, that in its informality, to-night's programme will resemble those of former years, and that many will feel free to speak a few words expressive of their regards of the late Dr. James Fletcher.

Speaking as a teacher, I naturally regard the work of an edu-

cationist, *ex-officio*, as the highest. Personally, I can testify that of all the non-professional educationists with whom I have associated during the past fifteen years, I owe the deepest debt of gratitude to Dr. Fletcher. I regarded him as almost indispensable to my development and I know that his death will be a genuine embarrassment in taking away a source of assistance and inspiration in my studies of nature. Such is my weak tribute to this very great man.

As the death of Dr. Fletcher marks the first break among the members of the original Council of the Club, organized nearly thirty years ago, it was deemed appropriate that the first President of the Club, Lieut.-Col. Wm. White, should preside at this meeting held in honour of the memory of a leading member of the original Council. I shall therefore ask Lieut.-Col. White to take the chair.

Lieut.-Col. White on taking the chair, said:—We are assembled this evening for the purpose of paying tribute to one of our earliest members, a well-loved companion and friend of every one of us; a man who was preeminently qualified for the position he held.

We have lost a dear friend and the country has lost a valued servant—whose name is a household word in the homes of the agriculturists of the Dominion. There are here this evening many members who of late years have been more closely associated with Dr. Fletcher, than I have been, owing to advancing age, and therefore without further words from myself, I shall call on several members of the Club to address you this evening, commencing with Dr. Saunders, Director of the Dominion Experimental Farms.

DR. FLETCHER'S WORK, ITS INFLUENCE ON CANADIAN AGRICULTURE.

BY DR. W. SAUNDERS

In this meeting called to honour the memory of our esteemed friend and fellow worker the late Dr. James Fletcher it is my privilege to say a few words on the bearing of his work on the advancement of agriculture. Prior to the organization of the Dominion Experimental Farms, Dr. Fletcher acted as Dominion Entomologist to the Department of Agriculture, a title conferred on him in 1884, and, in this capacity, he published two reports. His first report was published in 1884, and a second in 1885. These reports dealt chiefly with injurious insects, and they had a considerable circulation. At that time he was also serving the

country in the capacity of Accountant in the Library of Parliament.

On July 1st, 1887, Dr. Fletcher was appointed Entomologist and Botanist to the Dominion Experimental Farms and was transferred from the Library of Parliament to the Staff of the Farms. He was thus enabled to devote himself entirely to natural history and his work became the great pleasure of his life. For 21 years I was intimately associated with him from day to day and watched the development of his work with great interest. In his capacity of Dominion Entomologist he studied with much assiduity the many problems which presented themselves in reference to insect life, such as the life-histories of many insect pests which prey on the crops of the farmer and by their depredations often materially lessen his profits. He also studied closely the life-history and habits of the many parasitic species which feed upon and destroy the farmers' enemies, and thus render very substantial service. He also experimented with the means proposed for the destruction of the injurious species. The Entomological Division also prepared collections of both injurious and friendly species, showing them in all the different stages of their growth.

As Botanist he studied the value, as fodder plants, or such species of grasses and clovers as can be grown successfully in the different parts of the Dominion. He ascertained their relative value for the production of hay and recommended the most promising of them for general cultivation. These fodder plants were grown in plots adjoining the hedges at the Central Experimental Farm, where they could be conveniently shown to visitors and their advantages explained. He also studied the subjects of smut, rust and other parasitic fungi, especially such as are injurious to our valuable grain crops. He also devoted much attention to another class of enemies with which the farmer must wage war if he is to be successful. I refer to the weeds which infest his crops. These, if allowed to multiply, crowd out the useful plants he is growing, rob them of the moisture they need, also of much of the fertilizing material in the soil which would otherwise contribute to their nutriment.

In both these divisions of Dr. Fletcher's work the field was practically unlimited and in preparing his annual reports from the large mass of material available, the chief difficulty was to select the best and most useful. It was Dr. Fletcher's habit from the outset to endeavour to place his observations and conclusions before the public in the plainest possible language. On this point in one of his earliest reports he says: "In preparing the present report I have endeavored to make it useful to the agriculturist, all unnecessary technicalities have been eliminated, and only

such information has been included as I deemed would be useful."

His first report after his appointment on the Farm Staff, that for 1887, may be considered in its general usefulness and the variety of important topics discussed as typical of the series. This begins with an important article on the insects injurious to cereal crops, in which those affecting wheat claim first attention, followed by other injurious species affecting other valuable cereals. Insects affecting hay and clover are next considered, where the so-called Army Worm *Leucania unipuncta*, a species early regarded as a formidable antagonist, is dealt with, also the Clover Seed Midge which some seasons destroys a large part of the crop of clover seed. The worst pests which affect roots, potatoes and other vegetables are also described and remedies for their destruction referred to. The Codling Moth and the Tent Caterpillar, so injurious to the apple crop, also insects which are destructive to the grape, raspberry, currant and strawberry are all dealt with and, in the closing chapter, some of the worst insects affecting forest trees.

This brief enumeration of the subjects discussed gives one some idea of the scope of the work undertaken, and the presentation of each subject was so clear and practical as to arrest the attention of those looking for information, and if only a small percentage of the usual annual loss was saved by adopting the remedies recommended, the addition thus made to the farmers' profits must have been quite considerable.

Up to the spring of 1895, Dr. Fletcher had charge of the Arboretum and Botanic Garden at the Central Experimental Farm, and under his management good progress was made, but finding that his many other duties prevented him from giving the necessary time to this work, at his request Mr. W. T. Macoun was made Curator of this important branch of the service.

The twenty-one annual reports which were written by Dr. Fletcher, together with the excellent cuts by which the text was illustrated, have been of great value to the farmers of Canada by instructing them how to recognize their insect enemies, also their insect friends. Full instructions were given from year to year as to the most reliable and practical measures to adopt for the destruction of the more injurious species treated of.

He also waged a constant warfare against weeds, and his reports and bulletins on this subject are very valuable and are highly appreciated and followed by many of the most intelligent farmers throughout the Dominion. Bulletin No. 28 of the Farm series on "Weeds" was written by Dr. Fletcher, in which 164 troublesome plants are mentioned and the best way of fighting them. Dr. Fletcher also prepared that beautifully illustrated

work on "Farm Weeds of Canada" which, although published by the Seed Branch was written by Dr. Fletcher, who also supervised the preparation of the coloured plates, the work of Mr. Norman Criddle. Other botanical subjects were treated of in Bulletin 3 of the Experimental Farm series on "Smuts affecting Wheat," No. 19 on "Grasses", No. 23 on "Fungous Diseases affecting Plants;" No. 46 on "Alfalfa, or Lucerne."

The entomological subjects treated of in bulletin form, and written by him entirely or in part, were No. 11 on "Some Common Insects of the Farm, Orchard and Garden;" No. 14 on "The Horn Fly;" No. 37 on "Apple Insects;" and No. 43 on "Plum Insects." His last bulletin was No. 52, "Insects Injurious to Grain and Fodder Crops, Root Crops and Vegetables," in which 45 of the worst enemies of crops are dealt with. From his busy pen there appeared also from time to time several smaller bulletins, also numerous letters to agricultural and other papers giving accounts of the occurrence of insect pests in various parts of the Dominion and the best methods to adopt for their destruction.

For many years past, Dr. Fletcher was invited from time to time to give evidence before the Select Committee on Agriculture appointed by the House of Commons. On these occasions he dwelt on some of the most important occurrences of insects injurious to crops and the best methods of fighting them. His work in connection with grasses and other fodder plants was frequently referred to with many other subjects covered by the work of his Division.

During the past 21 years Dr. Fletcher carried on a large correspondence with farmers in almost every part of the Dominion. He also attended farmers' meetings in all the different provinces, where, in his addresses on various topics, he conveyed in a pleasant and forceful manner and in his own genial way much valuable information to his hearers. His influence was always exerted for good. He was happy in his work and in the consciousness that through his efforts the condition of the farmer and fruit grower was being improved and their employment made more remunerative.

In his position as Entomologist he was entrusted with the management of the federal fumigation stations, at Vancouver, B.C.; Winnipeg, Man.; Windsor, Ont.; Niagara Falls, Ont.; St. John's, Que., and St. John, N.B. At these points arrangements are made for fumigating plants, trees, and nursery stock generally, under the San José Scale Act to prevent any further introduction of that terrible pest. During the past two years, there was added to Dr. Fletcher's already very onerous duties the supervision of the spraying of orchards in the Indian reserva-

tions in British Columbia, to prevent them from becoming distributing points for injurious insects.

Dr. Fletcher was exceedingly kind and generous to young students, both in entomology and botany, freely giving them much of his valuable time in naming their specimens, and otherwise encouraging them in their work. His was a busy life and the good work he has done, especially in his efforts to further the interests of agriculture, will furnish a lasting memorial of his energy and industry, which will continue to live in the memories of those who have profited under his instruction, to the end of their days.

REMINISCENCES OF DR. FLETCHER.

By W. Hague Harrington.

The members and friends of the Ottawa Field-Naturalists' Club have assembled this evening, to testify to their deep sorrow for the untimely death of their esteemed and beloved friend and leader, and to express their great appreciation of the work which he so zealously and continuously carried on for the advancement of the Club and of scientific research in general. I have been invited to contribute some "Reminiscences of Dr. Fletcher," and am duly grateful for the opportunity to share in this tribute to his memory, though fully aware of my inability to do justice to the theme. Some are present who were his friends and fellow-workers from the inception of the Club, and to these there will be little new, but some who were more recently associated with him may be interested in a brief review of the earlier years of our fellowship. My chief qualification for this retrospect is that, almost from his arrival in Ottawa, I was privileged to enjoy his friendship and to have some share, not only in his scientific and public pursuits, but also in his more personal and private life.

During the past weeks, amid the duties of the day, or during the silent watches of the night, memories of my genial and gifted comrade have thronged upon me. Many of them are too unimportant to record and some seem too sacred for publicity, but even from the remainder there is difficulty in making a selection which will not be too long in the recital. The intercourse of three decades, with one of so varied attainments and interests, is not readily condensed into a ten-minute address, and the indulgence of my hearers must be besought in advance for overstepping that time.

To the companions of those fair early years, so pregnant with life and action, the death of our friend and leader comes as a

sharp reminder of the rapid flight of time and the fast approaching rest from labour.

“Already on our heads the years have spent
Their silver rime. How far the day is spent!
How soon the evening and the low green tent!

The low green tent! Nay, yonder azure dome,
Where myriad, myriad worlds unjostling roam,
Is none too wide if God shall make it Home.”

Fletcher had joined the staff of the Bank of British North America in London, on the 19th of April, 1871, and had been sent in April, 1874, to Canada where he was first stationed in Montreal. He was transferred to the Ottawa office on the 22nd of April, 1875, and my acquaintance with him began during that summer. He was then a handsome young man, in his twenty-fourth year (just three weeks my senior), endowed with unusual physical and mental vigor, and his strong vitality and genial nature made him a great favorite with his companions and rapidly enlarged his circle of friends.

Naturally, he speedily became prominent both in athletic and intellectual affairs, and as it was mainly in canoeing and other out door sports that we were first associated, they will be first touched upon. With the advent of the winter, which was one of abundant snowfall, the Ottawa Snow Shoe Club was organized, of which he was for some time captain, and merry tramps were weekly taken to outlying points, such as Billings' Bridge, etc. Survivors of those days will recall the tramp which was taken to Templeton, or as it was then called Gill's Wharf, on the 3rd of Feb., 1876. Snow was falling when he led the company of a score or so from the Parliament Square down to the river, and it was still snowing when, after a good supper and jolly evening, the return tramp was started about midnight. Several inches of snow had obliterated the trail and had made the going so heavy that some of the weaker brethren, without his frequent aid, might have been all night on the ice and have slept in the snow. When the tired party reached their welcome homes it was well on toward morning. Later, as referee, I witnessed a snow-shoe race which he had with Orde, one of his companions, from the old Suspension Bridge to Aylmer and back, and which was enlivened by two serious runaways started by the blanketed runners. Horses in those days seemed to bolt on slight provocation, but fortunately no one was injured, although sleighs and harness were broken. He was also fond of tobogganing and skating and often formed one of the gliding crowd in the old rink that stood on Slater St., not far from the present Arena.

During the summer there were frequent enjoyable week-end

camping trips up the Rideau or down the Ottawa, which afforded him opportunities for botanizing and especially for the collection of water plants. One such visit to McLaren's Bay is specially remembered by the following incidents. While transporting our canoe across the dilapidated tramway which ran from the river to the bay, he stepped on the loose end of a plank and dropped through to his armpits, being severely shaken and also receiving a blow on the head from the other end of the board. Then when we had launched our craft, it was necessary to cross a boom to reach our camping ground. We hauled the canoe over safely, and he had just got in, when the boom-log on which I was still standing rolled over and, to avoid upsetting the canoe and losing our guns, I had to jump into the water which was unpleasantly cool. However, we were soon snug in camp and suffered no ill results of our accidents.

In the autumn he was one of the organizers of the Ottawa Football Club and his sturdy form, in black and red stripes, was a pillar of strength in the scrimmages of that first memorable match, in which we over-whelmingly defeated and discomfited the then champion Brittanias, of Montreal. There is also a well-remembered paper-chase from Cartier Square, through the fields of the By estate, Stewart's Bush and Mt. Sherwood, across the Dam and what is now the Farm Arboretum, thence by the Locks and across the Rideau and so round by Billings Bridge and back of Archville to the starting place.

In May, 1876, he left the Bank to accept a more congenial position in the Library of Parliament, under his friend the late learned Dr. Todd, for whom he had the deepest esteem and friendship. Here he had ample facilities for prosecuting his studies in botany and entomology, in both of which sciences he was already well versed. The library was then more accessible to students than it has been of later years, as the hours were longer and less restrictions were imposed. Many pleasant and profitable hours did we spend there together, in the examination and study of valuable works of reference.

Fletcher had early found out the few botanists and other naturalists then living in Ottawa, and was energetically collecting and urging others to do likewise. Prior to my acquaintance with him, my attention had never been directed to any special branch of science, or research. A rambler in the woods and on the waters I had been from boyhood, but now under his magnetic influence Nature assumed new charms and interests, and my future life was thereby broadened and brightened, as have been the lives of so many others with whom he came in contact. Any progress which I may since have made in natural history, and any work which I may have accomplished therein are due chiefly to his

stimulation and to his continued assistance and encouragement.

Before referring to a few of the scientific bodies with which he was connected, mention may be made of a modest literary circle, whose somewhat formidable name of the Ottawa Mutual Research Society, has well-nigh fallen into oblivion. I do not know whether he was the founder of the society, but he was at least the permanent secretary and only officer. The club was limited to twelve members, each of whom in turn acted as chairman and host and proposed a subject for an essay, or set not less than four questions for examination. The resulting papers were read and keenly discussed and sharply criticized at the monthly meetings, and the society was thus an excellent training school for matriculation into other societies. The papers, often of considerable value, were not published, but a formidable pile of manuscripts gradually accumulated in the possession of the secretary. The society lasted for several years with more or less change of membership, but gradually the few earlier members who had been its backbone found their time absorbed by increasing cares and responsibilities and the club was allowed to lapse, though not without much regret on their part.

Fletcher had early joined the Entomological Society of Ontario, and in Sept. 1877 was elected a member of the Council and rapidly took a prominent position thereon. Always an ardent supporter of the society, he did yeoman's service in maintaining and increasing its efficiency and value. Two years later, largely through his influence, the honour of election to the Council was also conferred upon me and we jointly attended for many years the annual meetings of the society.

On the 14th of Oct., 1897, as we were returning from one of these meetings, we had the unpleasant experience of a head-on collision, between Stittsville and Ottawa, which caused a bad wreck. He was deeply moved at the loss of life which occurred and showed much sympathy for the wounded, and aided and cheered the survivors during the delay of some hours and in the transfer, through a boggy woodland lot, to the new train sent out from Ottawa.

He was elected President of the society in 1886 and held office for three years, and was again President for the two years previous to his death, a few days before which he had been re-elected for the sixth time. As his entomological work is to be treated of separately, I shall only mention his first paper, which appeared in the annual report of the society for 1878, under the title "An Outline Sketch of the Canadian Buprestidæ." This was a valuable contribution to the report, and I well remember the great care taken by him in its preparation. His subsequent yearly contri-

butions to the reports and to the Canadian Entomologist, including presidential addresses, were numerous and varied, and testify to his great ability and industry.

We became members of the Ottawa Literary and Scientific Society in November 1877, and in the following April he was elected Curator, an office which he held for six years, when pressure of other duties obliged him to resign from the Council, although he continued his membership long after his residence at the Farm made it impossible for him to visit the rooms, or avail himself of the advantages of the society. In 1879 he took part in a conversazione which discussed the value of a classical education and read a paper on the affirmative, and he always held and expressed the view that a knowledge of greek and latin was of very great advantage, especially to scientific students.

In May 1878, in company with Mr. T. V. Macdonald (Bank of B.N.A.) and Mr. Rinfret (Quebec Bank), we occupied a house on the hill beyond Billings' Bridge, where a most delightful summer was passed, all too rapidly. Macdonald, to his deep regret, was soon transferred to Montreal, but his place was taken later by the Rev. Mr. Patton. Here we pursued our entomological and botanical studies, and led by no means an idle or unprofitable life. Usually we had to walk to and from the city, but the road was then less monotonous for nature-lovers than it is now. The city extended not much beyond Maria St. and thence Bank St. was but a country highway. Where the McLeod St. church now stands we had to pay toll for the transport of our chattels, while westward stretched a rich collecting ground known as Stewart's Bush, through which we often strayed on our homeward way. Grouse and other game were still not uncommon in the thick coverts and swampy glades, and both the fauna and flora were unusually varied. Patterson's Creek was a pleasant stretch of water, and in our canoe we could paddle under the Bank St. bridge to a brook which entered some distance above. Beyond the creek a high board fence enclosed the race track on the Glebe, within which was a swamp with many plants which can now be only obtained far from the city. On the roadside, near the creek, was the old twin pine, a prominent landmark, in whose shade we frequently rested.

Fletcher was indefatigable in his botanizing and the results of his labours then and in the adjoining years appeared in his *Flora Ottawaensis* of 1879-1880. It might truly be said that:—

“Oft have we seen him at the peep of dawn
Brushing with hasty feet the dew away.”

After two or three hours along the river, or through the fields and woods, gathering plants, hunting insects, listening to the morning melodies of the birds and examining their nests, and pok-

ing and prying generally around in swamps and thickets, we would hurry off to breakfast with his big collecting box, known as the "bath," filled with the spoils. In the afternoon there was more collecting, and the evenings were spent in preparing and mounting specimens, and in the capture of any insects which might be attracted to our lights, set on a balcony and backed by a white sheet. There was little time for idle hands, but after dinner on fine days we might recline on the sward to smoke and chat with our housemates, and play with a fifth member of our establishment, namely Joe Fox, who often accompanied us on our evening rambles through the fields. He was full of graceful and amusing antics, delighting to gamble with the dogs, but his fondness for chickens threatened to make him very dear to us. On our return to the city I gave him to Fletcher, but after some amusing episodes he escaped and reverted to the life of the wild.

During this year (1878) Fletcher and a few kindred spirits often discussed the possibility and necessity of reviving in Ottawa the scientific researches which had existed in earlier years, and these discussions eventually led to the founding, in March 1879, of the Ottawa Field-Naturalists' Club for "the study of the natural history of this locality." Although he more than once publicly stated that the idea of the club may be said to have originated with Mr. R. B. Whyte, he was the central and moving figure in its organization, and to his sustained exertions during the many years in which he occupied various positions on the Council is largely due the progress and high standing achieved by the Club. He had ever its interests at heart and in the midst of multifarious duties, which made excessive demands upon his time and strength, he was ever ready to undertake some new service on its behalf.

As a botanist and entomologist, he realized the intimate relations which exist between plants and insects, and recognized the serious loss occasioned by the depredations of injurious insects upon the products of garden, farm and orchard. Foreseeing that, with the inevitable rapid extension of agriculture through the varied soils and climates of our widespread Dominion, and the unavoidable introduction of insects pests from abroad, the loss would be enormously increased, he devoted himself to the practical and economic aspects of his favorite studies, and vigorously began that campaign for the institution of investigations and for the dissemination of information, which occupied him for the remainder of his life. He was much pleased when, as the entering of the wedge, he was in June 1884 appointed Entomologist to the Department of Agriculture, and at the close of the year was enabled to publish a preliminary report of seven pages, which

was the forerunner of many publications of the greatest value to our agricultural communities.

Before the Committees on Agriculture, of the House of Commons, and in every direction whence assistance might be expected, he agitated and pressed for the establishment of permanent experiment stations equipped with a staff qualified to undertake and maintain the work, which to him seemed so imperatively demanded in the best interests of the community. It was therefore a great triumph and cause of joy for him, when the Experimental Farms were established, and he received the position of Entomologist and Botanist which he so successfully occupied for more than twenty-one years, making for himself a world-wide reputation as a leader in such work.

Thorough and painstaking in his investigations, though hampered always by inadequate quarters and insufficient assistance, he had also the ability to present the results in an attractive and simple manner. His position required him yearly to make extensive journeys throughout the Dominion and to address audiences of very varied aims and capacities. He also frequently lectured before learned societies, and delivered addresses to schools and organizations of divers kinds, and having been present on many such occasions I can testify that he invariably charmed his hearers by the simple, yet graphic presentation of his subject combined with his fine voice, his pleasing presence and his genial manner.

It is unnecessary to dwell upon the value of his official work, but a quotation may be made from an important address delivered by Dr. Howard, as President of the Association of Economic Entomologists in 1894. "Mr. Fletcher," he said, "has shown himself to be a man of extraordinary energy, a most entertaining writer and a most careful observer and one who has always kept the practical part of his work foremost in view. He has paid a great deal of attention to a side of his work which is neglected by many of our own official entomologists, namely, personal intercourse with farmers, frequent talks on injurious insects at farmers' institutes, etc., and has in this way built up a very large clientele among the most intelligent agriculturists in the Dominion."

Soon after the foundation of the Royal Society of Canada he was elected a fellow of Section IV, of which he was later President. He was an active worker for the society, holding for some time the Treasurership and then the laborious and responsible office of Hon. Secretary. He was also a member of, and held office in, several other scientific bodies, whose work we frequently discussed together, but which cannot be further referred to at present.



After his marriage in 1879, Fletcher resided for some years on Metcalfe St., within a stone's throw of the Stewart homestead, where now stands the stately museum building for whose erection he was so long and earnest an advocate. An orchard then blocked the street citywards, across which right of way was prohibited, but there were generally holes in the fences for those making a short cut. That section of the city was principally pastures, and in 1886, or later, I could still put on my snowshoes at my door on Gilmour St., and go straight across the fields for a tramp with him to some of our favorite haunts; now leveled into uniform monotony, and quartered in blocks of city dwellings.

His family life was an ideal one, where love and happiness were always in the ascendant and never have I known any happier hours than many which were spent at his cheerful fireside. Later, when he went to reside at the Farm, it was still my privilege to be his frequent guest and to pass with him many pleasant afternoons and evenings. When the weather was suitable we rambled or paddled about examining and collecting the products of land and water. In summer there were many charming little picnics on the banks of the Rideau, where above the rippling music of the rapids, or by placid reaches lily-starred, we found quiet enjoyment and surcease from care until the vesper songs of bird were hushed, the roseate glories of the West grown dim, and

"The warders of God's tent had lit the lamps
That men call stars."

During the winter he resided in the city, but on Saturdays, unless he was absent, or had some special engagement, it was my custom to go to the Farm and spend the afternoon with him. After a short snowshoe tramp through Dow's Swamp, across to the Rideau, or around the Arboretum and Forest Belts, or perhaps some slides on the toboggan, if there were young folk present, we would cook our supper, as if out camping, and then after a smoke and pleasant chat, would spend an hour or so in his office, examining insects, reading proofs, or other work, before walking home.

Our rambles and excursions during the many years of our joint interest in entomology, etc., covered all the immediate vicinity, and frequently extended to more distant points, such as the Mer Bleue, Casselman, Buckingham, Thurso, etc. A brief, but enjoyable, trip was taken in June 1892 to Copper Cliff, to visit a fellow-entomologist, Mr. J. D. Evans, then manager of the copper and nickle mines. Fletcher went largely in the hope of capturing *Erebia discoidalis*, a rare butterfly which had been taken by Mr. Evans three years previously. We arrived at 5 a.m. and to lose no time collected for a couple of hours before calling upon our host, who afterwards took us to the locality where he

had found the butterfly. No specimens could be found, but of other insects we obtained about 275 species, including some of considerable rarity and interest.

Our last outing was in September last when we paddled up the Gatineau and around the booms to the entrance of Leamy's Lake, where he desired to collect some water lilies. Owing to the extreme low water we found that there was quite a carry to get into the lake, and that it would be difficult to reach the lily bed, and as the day was exceedingly smoky and sultry and the sun low we decided to paddle back.

A few days previously we spent, with Mr. Groh, an afternoon paddling about the canal collecting water plants, and he was delighted to discover quite a large patch of the rare *Bidens Beckii* and also to find that the wild rice, which I had seen him sow two years before, seemed to be well established.

The briefest outing with him was invariably interesting, as his knowledge was so extensive and his faculty of observation so trained that there was ever something upon which new light could be given, or which could furnish material for future study. His intimate knowledge of large sections of the Dominion, and his extended acquaintance with scientists and other prominent persons, combined with his remarkable memory and unfailing brightness and geniality, made him a most charming and entertaining companion, either at home or abroad. He was a friend whom I can never replace, and whose loss will be felt afresh whenever the scenes of our outings are visited.

My last evening with him was that of the 14th of September, a day or so before he started on his last trip West. He was busy in his garden watering his flowers until it was too dark to continue, for so he spent many evenings among the beautiful and fragrant plants which he loved, and which afforded him such sustained and genuine pleasure. The task of planting and tending them was with him a labour of love, and not merely performed for the utilitarian or decorative effects which might result. His profound love of nature in all her moods and forms was in no respect more evident than in the patient and skilful gardening from which he derived such undoubted pleasure. Just before we said goodbye he gave me directions where to find a certain water weed which my collection lacked, for he had such an intimate knowledge of the habitat of our plants, and such a retentive memory that he could describe the exact locality in which any rare species had occurred, even if many years previously.

Any memories of my friend would be incomplete, if no mention were made of the deeply religious side of his character. Scientists and other public men not infrequently allow themselves to become engrossed and interested solely in material

matters, but he was also uniformly and consistently occupied with spiritual affairs. As a loving adherent of the Anglican Church, he gave to her interests an unbroken support and the same unfailing attention that all his duties received, and was ever a regular and devout attendant at its services. During our earlier companionship we attended for some time the St. James' Church in Hull, (since burnt) the rector of which was the late Canon Johnson, whose kindly words and actions endeared him to all his parishioners.

Fletcher was not content to be merely a church-goer, but as a lay-reader he took the service whenever necessary in several of the suburban and rural churches. At Billings' Bridge and Ottawa East I have on various occasions listened to services which gained an added beauty from his clear-voiced and sympathetic reading. He was also for many years Superintendent of the Sunday school at Ottawa East and took a great interest in the welfare of the school and of its attendants. Often on Sundays I went to meet him when the school closed, in order to walk home with him, and usually found him the centre of a group of smiling children, for with them he ever was on the most friendly terms and they loved him for his many acts of kindness and his unfailing geniality and sympathy. They, as well as their parents and teachers, have deep reason to grieve for the noble Christian man who was so long their trusted friend and helper, whose hand and heart were open to all who had need of assistance or sympathy.

No words of mine can give more than a faint idea of his real worth and character, but fortunately these are already widely known. He was truly a lovable man, one of those superior natures whose mental and moral attributes rapidly distinguish them as leaders of thought and action, whose kindly words and generous deeds cause them to be esteemed and beloved by all who come in contact with them. Faithfully and zealously he laboured early and late, with all his forces, to advance the welfare, not only of the agricultural classes, but of all sections of our fellow-citizens. Year by year the seed was sown, often in stony and unprofitable ground, but ever with some increase in the garnered harvest. Others will take up the work he initiated and organized, and their way will be smoother and easier by reason of his unselfish and unremitting toil and watching.

The members of the Ottawa Field-Naturalists' Club may continue to show their esteem and affection for our departed friend and leader, and to honour his memory, by steadfastly striving to maintain and advance the investigations and studies to which he so ardently and successfully devoted his great abilities.

DR. FLETCHER AS A BOTANIST.

By R. B. Whyte.

One day, thirty-two years ago, when struggling alone with the many difficulties which beset a student of botany, I heard with more than passing interest of a young man employed in the Library of Parliament who was making a study of botany. With little delay after hearing of that student of nature I sought him out and made myself known to him. Little did I think then that I was making the acquaintance of one who through so many years was to prove a true, sympathetic and loyal friend. That young man was James Fletcher.

A few months after I had first met him, when discussing the difficulties of studying alone, the idea occurred of having a place where we could meet others similarly interested. The suggestion was carried out, and thus originated the Ottawa Field-Naturalists' Club.

Those of you who have of recent years become members of the Club have no conception of how indefatigable and self-sacrificing he was in his efforts to maintain the Club—no labour was too hard, nor any effort too great if it was for the benefit of the Club in those early days. As an instance of his sincerity of purpose, I recall many, many times that he delivered with his own hands the notices of the Council meetings in order to save the Club the expense of postage.

One of his first works after we were in a position to publish a record of our researches, was to compile a list of all the plants that had been found in the Ottawa district. This list appeared in the first number of the Club's Transactions. The list was added to in subsequent years and finally published as "*Flora Ottawaensis*." His great regret was that his official duties prevented him from finishing that work.

As a companion and co-worker he was ever ready to help and encourage, and no trouble was too great to help any one in studies or with information. By correspondence and through the press, by addresses and lectures at the educational institutions in the City and at the Field-Naturalists' Club's meetings he unceasingly endeavoured to impart information, and to his great efforts are we indebted for the undoubted high plane of botanical knowledge in the City of Ottawa to-day. I have always claimed, and I do not think the claim extravagant, that there is no City in the Dominion where the general knowledge of plant life is so high as it is in Ottawa.

Great as have been the results of his work in increasing our knowledge of plants, his best work has been in economic botany. For many years he travelled all over the continent addressing

meetings of farmers and farmers' institutes and has probably addressed more people than any other public man in Canada and imparted to them information of economic value which must have been of immense benefit.

The culmination of his work in economic botany is the *Weed Book*, published in 1906 in conjunction with the Seed Division of the Department of Agriculture, Ottawa.

Not only as an entomologist and botanist has he been of great assistance and influence, but also as a horticulturist. Throughout the Dominion of Canada the horticultural societies have known him for many years as advisor and educator. At the Convention of Horticultural Societies held in Toronto recently which I attended, many were the expressions of sincere regret at the great loss the horticultural societies had sustained by the death of one whom they spoke of not as a public official, but as a personal friend.

The life of Dr. Fletcher was a standing example to young men. While a clerk in the Parliament Library he utilized every spare moment in studying or seeking information, and after office hours he did not waste his time in idling about the streets. Early and late he was to be found studying Nature and, when in later years, the Government decided to establish the Dominion Experimental Farms, he was the one man in Canada equipped with the necessary knowledge to fill the important and responsible position of Dominion Entomologist and Botanist.

Finally, considering the great debt that the Ottawa Field-Naturalists' Club owes to Dr. Fletcher, I think it is our privilege to take the lead in commemorating the work he has done, and in talking the matter over with some friends and members of the Club, the unanimous opinion is that in no way could we do it more appropriately than by erecting a drinking fountain at the Central Experimental Farm, where so many of the best years of his life were spent.

DR. FLETCHER AS AN ENTOMOLOGIST.

BY ARTHUR GIBSON.

I am very glad indeed of this opportunity of saying a few words of one with whom it was my happy lot to be closely associated, for nearly ten years, in the official Government work of practical entomology. It is not necessary for me to say that Dr. James Fletcher was a great entomologist. This fact is widely known, not only in Canada and the United States, but even throughout the whole world. It is the people of Canada, however, who will chiefly miss his kindly help, always so cheerfully

given. To Canadian students of insects, his untimely death is a terrible blow, and entomology generally has lost one of its most accomplished exponents. Early in life Dr. Fletcher had a keen love for insects and their ways, and before he came to Canada he was familiar with the butterflies and other insects of his native land. He made a special study, however, of those kinds which are injurious or beneficial, and never lost an opportunity to add to his knowledge of these creatures, which play such an important part in the welfare of mankind. Not a few Canadians have done splendid work in entomology, from the continued encouragement and help which they received from him.

From a purely scientific standpoint Dr. Fletcher did splendid work among the diurnal lepidoptera. For many years he was intensely interested in Canadian butterflies and through his studies was recognised as a high authority on these insects by American entomologists. He was not only a student of the perfect forms of butterflies, but was deeply concerned in finding out their true life-histories. Many a long trip from Ottawa was taken by him to get the eggs of a rare species, in order that the various stages of the insect might be studied. During these collecting trips, too, many new species were discovered. If we glance through the lists of North American insects, we find that quite a number of species were named in his honour. The following is a list of the insects to which the name of Fletcher has been given:—

- Cryptus fletcheri* Provancher: Additions Faune Hymenopterologique, 1886, Vol. II, p. 361. (= *Comsocryptus calipterus* Say).
- Xylomiges fletcheri* Grote: Canadian Entomologist, 1888, Vol. XX, p. 130. (*Xylomiges patalis* Grote).
- Coleophora fletcherella* Fernald: Canadian Entomologist, 1892, Vol. XXIV, p. 122.
- Cratæpus fletcheri* Ashmead: Canadian Entomologist, 1892, Vol. XXIV, p. 309.
- Lecanium fletcheri* Cockerell: Canadian Entomologist, 1893, Vol. XXV, p. 221.
- Trogus fletcheri* Harrington: Canadian Entomologist, 1894, Vol. XXVI, p. 245.
- Coccophagus fletcheri* Howard: Bulletin No. 7, New Series, Division of Entomology, U. S. Dept. Agr., 1897, p. 63.
- Papilio turnus* L., var. *fletcheri* Kemp: Entomological News, 1900, p. 481.
- Culex fletcheri* Coquillett: Proceedings of the United States National Museum, Vol. XXV, 1902, p. 84.

Catocala unijuga Walker, var. *fletcheri* Beutenmuller: Bulletin of the American Museum of Natural History, 1903, Vol. XIX, p. 509.

Xylina fletcheri Smith: Psyche. 1904, Vol. XI, p. 56.

Enarmonia fletcherana Kearfott: Canadian Entomologist, 1907, Vol. XXXIX, p. 127.

Brephos fletcheri Smith: Canadian Entomologist, 1907, Vol. XXXIX, p. 370.

Platyclus fletcheri Caudell: Proc. U.S.N.M., Vol. XXXII, 1907, p. 403. (= *Idionotus brevipes* Caudell).

Eupithecia fletcherata Taylor: Ottawa Naturalist, 1907, p. 200.

Lithocolletis fletcherella Braun: Transactions of the American Entomological Society, 1908, Vol. XXXIV, Oct., p. 338.

Psilocorsis fletcherella Gibson: Ottawa Naturalist, Jan. 1909.

Speaking more particularly of his work in economic, or practical, entomology which occupied the best of his time and labour for at least 25 years, he has truly left behind him a vast store of knowledge in the annual reports which he presented to the people of Canada in the large yearly reports published by the Dominion Experimental Farms, in the special bulletins which he prepared, and in the almost yearly Evidence which he gave before the Standing Committee on Agriculture and Colonization of the House of Commons, all of which have already been referred to by Dr. Saunders. In all of these publications valuable information on insects injurious or beneficial to agriculturists, horticulturists and others, is given in the most accurate manner, with the remedies which have been found most useful for those kinds which are destructive to crops, etc.

Of the many injurious insects upon which he did original research work, brief mention may be made of the following.

The Mediterranean Flour Moth, which first appeared in Canada in 1889: its life-history was worked out and the advantage of freezing the insects by opening the mills to the cold of winter was pointed out, among other remedies.

The Cigar Case-bearer of the apple was first treated of in his annual report for 1891, and further original observations are to be found recorded in his report for 1894.

The Hop Vine Borer did much harm in Ontario hop fields in 1892. The habits of the insect were studied and published. The same year new facts were learned regarding the life-history of the Red Turnip Beetle, which every year does some damage to cruciferous crops in the Prairie Provinces.

The Pea Moth claimed special attention in 1894, and a lengthy article was published in his annual report for that year.

The Peach Bark-borer was also studied the same year and new facts recorded regarding the life-history.

In 1895 the Joint-worm which attacks wheat was investigated, and valuable information was obtained on the habits of this enemy of this important cereal. The Cottony Grass Scale was also studied the same year, as was also the New York Plum Scale.

Mention of the Wheat-stem Maggot in Canada first appeared in his 1896 report when an outbreak which occurred in the Northwest was studied. The same year the first record of the Apple Maggot in Canada was made.

In 1897 much study was given to the San José Scale, which had gained a firm foothold in certain of the western counties of Ontario. A lengthy article appears in his report for that year.

The Rocky Mountain Locust was given special study in 1898 when the insect did much damage in southern Manitoba.

The Hessian Fly wrought serious injury in the fall wheat fields of Ontario, and the spring wheat fields of Manitoba in 1899, and called for special investigation. The same year the Destructive Pea Aphis made its first appearance in Canada, as did also the Asparagus Beetles.

The Greenhouse Leaf-tyer was also studied in 1899 and 1900 and the life-history has since been published.

One of the most remarkable outbreaks of an injurious insect which has ever been recorded in Canada occurred in 1900, when the Variegated Cutworm appeared in British Columbia. Original notes on the life-history appear in his annual report for that year, as also on the Spotted Cutworm which did much damage in Ontario.

In 1901 original observations on the life-history of the Variable Cutworm were published and a more complete article describing in detail the various larval stages appeared in the Canadian Entomologist for November, 1902. Notes are also given in his 1901 report on *Semiophora youngii*, a new enemy of conifers.

The Sugar Beet Webworm was studied in 1903 owing to the damage it did in Manitoba. Attention was also given to the White-marked Tussock Moth, which has done so much harm to shade trees in many Canadian cities.

During 1905 another new pest made its appearance in eastern Canada in destructive numbers and the common name, "The Spined Rustic" was given to it by Dr. Fletcher. The full life-history was worked out and published.

The first Canadian nests containing caterpillars of the Brown-tail Moth were received by Dr. Fletcher in 1906, and during the summer the insect was studied at the Central Experimental Farm, and a lengthy article on it was prepared and pub-

lished in his annual report, as well as in several agricultural papers.

The same year and in 1907 the Rose Chafer caused enormous losses in vineyards in the Niagara district, an account of which appears in his report for 1907. The same year the Rusty Tussock Moth was given special study.

In 1907 and during the present year, the large losses in the hop-yards of British Columbia occasioned by the attacks of the Hop Flea Beetle, called for special thought, and during his recent trip to British Columbia in September last he visited the hop-yards and gave valuable advice to those in charge.

The above are only a few of the injurious insects upon which Dr. Fletcher did original research work. His studies of even the very commonest insects resulted in the finding out of new facts.

In his annual reports, etc., Dr. Fletcher did grand work in educating farmers, fruit-growers, market gardeners etc., to know their worst insect enemies and the way to fight them, and many articles appeared by him on such well-known pests as the San José Scale, the Codling Moth, the Plum Curculio, the Colorado Potato Beetle, the Turnip Beetle, Root Maggots, Cutworms, Grasshoppers, the Hessian Fly, the Wheat Midge, the Western Wheat-stem Sawfly, the Joint-worm, the Oyster-shell Scale, White Grubs, the Pea Weevil, etc, etc.

In the year 1896, Dr. Fletcher received the honorary degree of LL. D., from Queen's University, in recognition of the great services he had rendered to agricultural science. He also received honours from various foreign societies. He was elected a Fellow of the Linnæan Society, a Fellow of the American Association for the Advancement of Science, a Fellow of the Entomological Society of America, a Member of the Association for the Promotion of Agricultural Science, an Honorary Member of the Lancashire and Cheshire Entomological Society, a Corresponding Member of the Washington Entomological Society, and was at the time of his death President of the Entomological Society of Ontario and Honorary Secretary of the Royal Society of Canada. He was the first man to urge the formation of the Association of Economic Entomologists, which is the most important society of its kind in the world. For many years he was a member of the Editing Committee of the Canadian Entomologist, and quite recently, since their beginning, was on the Editorial Boards of the Journal of Economic Entomology and of the Annals of the Entomological Society of America.

NOTE—Plate No. VI is from a small negative taken two years ago by Mr. Shutt, and is considered as giving Dr. Fletcher in a characteristic pose. Members and friends can obtain copies of the photograph from the Topley Studio, Ottawa.

DR. FLETCHER AS A NATURALIST.

BY PROF. JOHN MACOUN.

My intention to-night is to speak of Dr. Fletcher as a Naturalist, for as such I was privileged to know him well. I was twenty years in the field when I came here in 1876 to give evidence before the Committee of the House of Commons in connection with the development of the West. I spent two days here and amongst the other boys I met at that time were Dr. Fletcher, Dr. Small, Mr. Harrington, and one or two others of the old men of to-day. Three years later I came back to live here during the winter of 1879-80 and then came in contact with Dr. Fletcher, who in the three years intervening had developed. How did he develop? How do men pass from the condition of ignorance into light? By the methods pursued by the young men of to-day? No. The young men of the past worked; there was less play then than to-day. I can see Dr. Fletcher and so can you, Sir, when he was Accountant in the Library. What I had never seen before I saw on his desk, a wardian case, in which plants are kept in a humid atmosphere and developed so that they may be seen and studied for a length of time. Alongside of the wardian case stood a couple of glass jars and in these jars were insects, either as caterpillars or in a more advanced stage, and he was studying them while attending to his regular duties. When the other gentlemen stood up here to-night they spoke of Dr. Fletcher as being a teacher who talked about what he knew. Nine-tenths of the men who talk don't know, but he always knew. How many men present to-night could argue with him? Whether he was right or wrong, he was always right, and it was a strong man who could argue him down. Hence, I often said, "Fletcher, there is no use arguing about it, we cannot change our opinions." But Fletcher knew and could teach others and there is where his power lay. He went into the country and talked to men. I know old people who look upon him as a god because every word that he spoke went to their hearts and they lived on his word. His power lay in the development of the man as a naturalist and a teacher. I have been going through this thing in the night and thinking over Dr. Fletcher since his death and of the many thoughts was, "Why was there such a man?" I have met during the last fifty years many men, amongst them Dr. Gray and Dr. Torrey, old men, and a host of others, but none like Dr. Fletcher. Here is the reason. The first summer I was here, 1880, I began to see something about him that was different from others. He was not like

anything America had produced. I set him down as a product of the English school system because the gentlemen I met in England were all interested in natural history. He was a man who studied botany, ornithology, entomology, geology and all the other branches of natural science. Dr. Fletcher was a man, a true naturalist, he was a man on all lines, if he went out with me he studied botany, if he went out with Mr. Harrington he was poking around the bark of trees discussing insects which to me were a blank. When we went to collect clam-shells down the Ottawa River he could study the water-plants with me and the shells with Mr. Latchford. The reason he was first in this, first in that, and first in everything, was because he was always busy, always at work, and as soon as he learned a thing he was ready to tell it. Other men would tell us nothing; he would tell us something in a simple, quiet, easy way, and we went home and absorbed it. I never expect to see any Canadian approach Dr. Fletcher on these lines. I never found the equal of Fletcher as an all-round naturalist. As you remember, nearly one hundred and fifty years ago a gentleman lived in England named White, of Selborne, a learned gentleman, who wrote on general natural history. Since his time no man has risen in England like him. He was Dr. Fletcher's prototype. There was no man like Fletcher in the multiplicity of subjects he took up. We read of Darwin, but Darwin ran in grooves as you all know. If you take up any of the other great men you will find that they also ran in grooves; but not so Fletcher.

In connection with this, I may say now there was another point which I discussed with Fletcher the first year I was down here. Talking of natural history, he said that he was going to take up all subjects. I laughed at him, I said I was a geologist; I had gone through entomology long before and discovered I didn't care enough about it to continue to collect, and presented my insects to Mr. Evans, of Trenton, and abandoning entomology had fallen back upon botany. He said, "Why should I not take up all subjects?" Of course, gentlemen, I was like most sceptical people, I laughed at him, and said, "You will start five or six things and finally drop them." But, he had such a power of persistence, as has been so well brought out to-night, that he never failed to accomplish what he set out to do.

My young son and myself were up at Nepigon twenty-four years ago last summer. He was quick on his feet and I was slow, getting well up in years; we saw a fine butterfly go past down the lane, and I said we must get that butterfly, and we obtained perhaps a dozen. I brought them home and showed the butterfly to Fletcher and he said, "Why, Macoun, that is

the greatest discovery of the age, the finest catch for many years," and eventually it was named after me. He got from me particulars of where it should be looked for, and he and Dr. Scudder, of Boston, went three years in succession to Nepigon to get the eggs of this butterfly, so as to rear the larvæ and follow up their life history. They went three years in succession before they got them; *that* shows you the persistence of Fletcher. Now, if it had been me I might have gone one year in search of it. There is where his success lay, and I will always maintain that the man who fights the longest wins. It is the chap who stops first who loses the battle. Fletcher never lost a battle. It might be a drawn one, but it was never lost.

Now, I don't think that it is possible to develop in America a naturalist of the type of Fletcher. To-day, natural history is becoming specialized. Botany of to-day is taken up by a dozen working on different lines. When I was young I had to carry it all; Now, entomology is taken up by a dozen in the same way. All things are changing and hence development will prevent the naturalist of his type coming to the front.

He was made Botanist and Entomologist of the Experimental Farm. We who knew him before that time can remember well the kind of man he was then and the kind of man he became. When he went to the Experimental Farm he began to study natural history on the economic side as he was in duty bound to do. When Dr. Fletcher became Botanist and Entomologist, as Dr. Saunders has told us, he commenced at once to study botany and entomology in the way that was required of him for his work, and from that day forward he was an economic naturalist. He studied things necessary to his work, and therefore he became a power in the country and the Government never had a servant that went up and down the country and did so much good as Dr. Fletcher. It is all very good for politicians to make speeches, but they mostly amount to so much hot air. When a man like Dr. Fletcher and men of his type go up and down the country and talk to the farmers and give them information about every difficult thing that they ought to know in their everyday work, these speakers are much more useful than the other class.

There are many men in the country to-day who have through him become useful men in their day and generation, and now I ask what will the young people of Ottawa do who used to sit in this hall and hear his speeches so full of life and power? We shall never see the like of Dr. Fletcher again, but his work is not done. His spirit lives in the hearts of the people of Canada.

DR. FLETCHER AS A LEADER.

BY DR. H. M. AMI.

It is with great difficulty and diffidence that I attempt this evening to describe to you Dr. James Fletcher as a Leader. The painful loss we have sustained is too recent, and too great, to permit me to even attempt to do justice to him. His all-round personality, genial, kind and affable ways, his utterances and activities are so deeply imprinted upon us by the years of intimate and constant relations that their full living reality cannot be connected with the unutterable pain we experience in the loss we have sustained.

It is only three weeks ago to-day that we followed to their last resting place the mortal remains of our dear departed leader and friend.

Many years and many times we had followed him in those pleasant paths and bye-ways where the Trilliums and Ginseng flourish, where the Spring-beauty and Hepaticas thrive, and where the rare orchids hide their fringed or fantastic blossoms. Suddenly, when we least expected it, he who had been our leader in botany, in entomology, in conchology, in so many and interesting branches of natural history; he who had banded us together and had founded our Club; he who had been the cheery friend of every member of the Club for twenty-nine years; was taken from us and cut off in the prime of manhood. We mourn his loss to-day not alone for what he was to the Club from its very inception—a constant inspiration and a devoted Leader but, also, for what he was to each of us individually—a friend, an example, an ideal man, a man with wide sympathies and firm convictions, fond of knowledge and of truth, of a tender, patient and winsome disposition, as well as of a resourceful nature. His sweet, wholesome influence, his truly unselfish nature, and his beneficent example must ever be a light which will radiate in our community with increasing power as years roll on. His great spirit permeated every branch of the Club's work from its earliest days, and for sound counsel and critical advice we naturally and invariably turned to him. May his life and work be ever kept before our eyes and minds.

What a privilege to have known Dr Fletcher!

He was an ideal Leader, and it is of him as such that I have been asked to speak to you to-night. To be a Leader one must be a seer. He had his visions and in the pursuit of his high ideal Dr. Fletcher fairly drew us along. His great faith, in all that tended to the ideal, the noble, the good, and the true, which was so manifest in him, made him look far into the

broader aspects of those pursuits and studies which occupied his attention.

He never spared himself, but with an ever-springing energy devoted his life to the study of the natural history of the Ottawa District and of the Dominion of Canada, as well as of those larger and international problems and relations, which widened the scope of his researches enormously.

His deeds and suggestions as a Leader I shall not here attempt to recite. You know them all. The members of the Club who have been closest in touch with Dr. Fletcher since the inception of the Club know well the ceaseless and untiring zeal which he displayed in its welfare and on their behalf. All the Normal School classes, which from year to year were wont to attend the Club's Excursions and Soirées, also know well the devotion which he displayed on all these occasions. Educational Institutions of the city, including the Kindergarten children, received inspiring words from him and listened to his enthusiastic utterances on the plant and the insect world.

We cannot realize that he is gone and is no more with us in reality. His presence in our midst for so many years, combined with his powerful physique and constant jovial expression, which made his leadership so attractive, pleasant and inspiring, still permeates our inmost soul and being so thoroughly, that his influence is still felt and will continue to exist. There is not a flower, nor an insect, which does not recall him, which does not bring to mind his noble countenance and winsome ways. There is not a brook, valley, crag, hillside, wood, or swamp; not a spot in the Ottawa District which does not vividly suggest him.

Who can forget those vivid pictures drawn upon the canvas of our minds by his charming words when Dr. Fletcher described to us the life-history of some butterfly, or the capture of a rare and interesting species in the Rockies. How he led us, step by step, in captivating fashion through all the intricate ways of his adventures until the goal of his ambition was reached. How, breathlessly, we listened to his graphic descriptions! How keenly interested he himself was, and how he seemed to live over again the experiences he had enjoyed or suffered! These and hundreds of other utterances by him we shall never forget.

His busy life kept him constantly at work with Nature. In this work he found pleasure and by it gave the same to tens of thousands in Canada and elsewhere.

Nature Study articles of recent years, were a special feature of his writings, and these are masterpieces of composition as well as of comparison and observation.

Not only was Dr. Fletcher one of the founders and organizers of the Club as well as Leader all these years, but he also contributed many articles and papers to our transactions. The first paper in our first volume was by him. This was his inaugural address delivered on 24th November, 1879, which is a masterpiece written by a master-mind. What an appeal this was to us to work up the natural history of Ottawa and its environs! Let every member who can, read this address once more and receive the inspiration which he instilled into his hearers those many years ago. To quote from this address will be to give in his own words the keynote of all his endeavors in the field of Nature about Ottawa. In speaking of the newly-formed Field-Naturalists' Club, he said:—

"One of the chief benefits bestowed by an organization, such as ours, is that it enables one always to know where to find a sympathetic companion. Of all recreations, there is none, to my mind, more enjoyable than a walk in the country with a congenial friend. No kind of intercourse brings you into closer contact with a companion than taking a walk. You cannot take ten steps, even with a stranger, without feeling a necessity of saying something, and if there is anything in a man, you can soon bring it out of him in a country walk. Now, it is very clear that a judicious choice with regard to your companion is a most important matter; but it is not always easy to find one who has the same tastes or takes an interest in the same subjects as yourself."

In speaking of a naturalist, he said:—

"No one looks upon the world so kindly as he does; no one else gives so much to, or takes so much enjoyment from, the country as he does, and he holds a more vital relation to Nature, because he is freer, and his mind is more at leisure. Moreover, when a naturalist gets a friend, who is not one, out in the country, he feels a sort of moral responsibility resting upon him to find something particularly interesting to point out, so as to arouse his curiosity, and, if possible, to convert him to the study of 'La Belle Science.' I say particularly interesting, because everything in Nature is interesting and beautiful; and I defy anyone to bring me a single object, picked up by a country roadside, which is not beautiful, and even exquisitely so—a stick, a piece of straw, a leaf, or a stone, it matters not what, if properly examined and understood, they are all wonderful and lovely."

After describing a number of commonplace objects and showing their beauty and attractiveness, he goes on:—

"The reason I have dwelt at such length this evening on these objects is to endeavor to point out that there is nothing,

not even the commonest object in Nature, that is not worthy of a careful examination. It is a great mistake, but a mistake which is often made, even by scientific men, to suppose that new knowledge can be gathered only from the unexplored fields of science, when, in the most familiar walks of life, there are countless riches of truth which the reapers, in the hurry of the harvest, have passed unnoticed, and which will abundantly reward the careful gleaner. The French aptly express this thought in the proverb, 'La Science court les rues'—'Science runs the streets;' or, more freely translated, knowledge is to be found everywhere, by those who will look for it, for it is so plentiful that it runs in the very gutters of the streets."

In conclusion he said:—"Let us, then . . . strive, while working up the natural history of our neighborhood thoroughly, to do so in a popular manner, intelligible to all. I believe we have it in our power to give much happiness to many, by inducing them, by our example and persuasions, to study with us Nature. Its wonders are open to everyone, from the youngest child to the aged man; it offers charms and fascinations to all—for all is wonderful and beautiful; and, as nothing makes men so happy as contemplating the beautiful, I consider nothing is so well calculated to make men good and happy as a study of Nature."

What Dr. Fletcher was as a Leader is recorded, though only in part, in the volumes of Transactions of the Club, which are as a monument to his memory. His "*Flora Ottawaensis*" was a feature of the early days of the Club and his endeavor was to obtain as complete a series as possible of our local flowering plants and ferns.

He drew us all together by the magic power of his sweet personality, by the enthusiasm of his love for Nature all about us, and by the kind words and deeds which he uttered and performed even unto the end.

The secret of his good life lay in the fact that he himself was led by motives and visions of the highest and best ideals. Inspired by a strong desire to see others enjoy Nature as he did, he presented the truths as they were revealed to him in a most delightful and pleasing manner. The simplicity of his remarks even when dealing with difficult subjects, marked him as a clear-sighted and keen observer and a vigorous and successful lecturer. With what care he described all he saw of interest in the field and forest, on the road or in the street! Oftimes he was called upon to repeat the same facts and truths, but he never wearied of imparting knowledge. In the numerous excursions and sub-excursions of the Club about Ottawa he was the rallying point and centralizing force. In all his ad-

dresses likewise he led us by ways that were pleasant, and taught us how to collect, classify and preserve plants and insects or other objects of natural history. He was ever teaching all who attended the outings and soirées these fundamental principles in acquiring material for study. In the work of the Club, Dr. Fletcher was *facile princeps* and was our Leader *par excellence*.

Well do I recall at this time the first excursion which the Club had to King's Mountain, Chelsea. What a glorious day! What a glorious Leader! His buoyant nature, cheery disposition and winning ways attracted as so many magnets, and oftentimes the geological and the entomological as well as other branches joined the botanical section, because he as the Leader drew everyone, from the child—eager to learn everything about Nature—to the older members and visitors.

He saw beauty, order and use in everything, and the world about him filled his life with numberless surprises and treasures. He was at one with Nature and she revealed herself to him as she does to but few. His enthusiasm was catching and he imparted not a little of it to his friends and associates.

No one can estimate his worth, for he was everything that one can imagine to us as a Club and to many scientific societies and institutes in our land. He understood the relations existing between the plant world and the insect world to a remarkable degree. It was this keen perception and accurate knowledge that led him to take such a deep interest in our farming communities.

How eagerly and zealously he guarded their interests and spoke in their behalf at the Sessions of the Agricultural Committees of the House of Commons when he was stationed in the Library of Parliament. And what a central and attractive spot that Library of Parliament was to us younger naturalists in the 70's and early 80's.

His work at the Central Experimental Farm, whither he was called in 1888, took him wholly into the realm which he loved and cherished.

We deem ourselves fortunate—though now deeply sorrowful—to have been permitted, many of us for so many years, to have accompanied such a Leader into so many paths of pleasure in this neighborhood and elsewhere. His deeds were many and good. His energies were spent for the welfare of all with whom he came into contact. In his death the Club has lost its greatest friend and supporter and Leader. We owe him a deep debt of gratitude which years of service in the same cause can only begin to express.

Those of us, who followed him in many of his outings

with the Club and other organizations, are conscious of a great loss. Nevertheless "we mourn not as those who have no hope," for from his heart and soul there radiated an influence and inspiring grace which the child of God, the Christian in the highest sense of that term, alone can possess, and which can soothe as well as, in time, satisfy the grief and loss we have sustained.

At the close of Dr. Ami's paper, the Chairman asked if there were any present who would like to add their tribute, and in response to this invitation, the following addresses were made.

MR. FRANK T. SHUTT, Chemist of the Dominion Experimental Farms, spoke as follows:—

It is as a co-worker and friend of many years that I would add a word of tribute to-night to the memory of the late Dr. Fletcher. As most of you are aware, Dr. Fletcher and I have been colleagues since the establishment of the Experimental Farm system, now twenty-one years ago, and from the first we became fast friends. His work and mine had the same field—the Dominion of Canada—and it was only natural that a part of our labours at least should be in common. Many of our investigations were carried out together, the chemical work supplementing the botanical or entomological, as the case might be. As instances I may cite our investigation to determine the agricultural value of native and imported grasses and the many problems respecting the efficiency of insecticides. With a full realization of the value of the results from the biological standpoint, he, at the same time, recognized the importance of chemical data. Further, while making himself cognisant of the chemical details, he kept well within his own province in his dicta, referring his readers or hearers to the right authorities when, in treating of a subject, it was necessary to bring before them facts outside his domain and requisite to present the matter in its fullest aspects. You will thus see that it was a very pleasant thing to be associated with him and that our work was carried out together in the most harmonious manner.

Of his ability as an economic botanist and entomologist, and the most excellent services he has given to his adopted country as such, there are many here to-night better qualified to speak than I am. But I would add a word to this testimony in my belief that his large and wide knowledge of Canada and of the conditions that prevail in the various parts of the Dominion was of inestimable value to those to whom he was imparting information. He had travelled and observed in every province of the Dominion and this in itself gave much weight to his opinions and advice.

Reference has been made to Dr. Fletcher's generosity, his desire to help others, his readiness always to do a good turn; it was surely these fine qualities that dominated his life. There must be hundreds scattered all over this wide Dominion who will miss his kindly assistance and encouragement. And this goodness of heart was only equalled by his capacity for work. My bedroom window commanded one in his office, and night after night for weeks together I would retire—and that at no very early hour—leaving his light burning. He was naming botanical and entomological specimens for amateur collectors all over the country, scores of whom probably he was thus encouraging in their studies by his kindly help. He must have been blessed with a strong vitality and much strength, for by sunrise next morning, if the season were summer, he would be out gardening—a work, or rather a pastime for him, of which he was an ardent lover. He took the greatest pride in his garden and nothing gave him more pleasure than the presenting of its products to his friends.

It was, of course, in his addresses on Nature Study and allied subjects that he won his laurels and gained a wide popularity. He was a particularly attractive speaker. Of good presence, with a pleasant voice, of an easy yet enthusiastic manner with fluency of speech it was not difficult to hold his audiences entranced in his description of Nature and Nature's children. He carried his hearers with him, so that they forgot the immediate surroundings and were transported in spirit to the mountain side or the bank of the stream as he went in quest of his plants or insects.

But we must not overlook the fact that a very large part of his useful work was done with the pen. I always thought he had a love for letter writing. He had a wide and ever increasing correspondence respecting plants and insects and he encouraged it. His was certainly the "pen of a ready writer."

We all like to think of him as our own personal friend. His cheery, jovial, kindly spirit—for by nature he was buoyant and light hearted—won all with whom he came in contact. Even those who only met him casually will have a pleasant memory of his genial manner and desire to help. Since Dr. Fletcher's death I have received many letters from mutual friends and they all bear warm testimony to his sterling qualities and his charming personality. To those of us who knew him well, intimately, he was a loveable man, warm in sympathy and true, a man of generous impulses and kindly, considerate thought for others. We mourn the death of a dear friend and a truly Christian gentleman. But while we must all deplore the cutting off of such a bright and useful life in the midst of its activities, we must equally rejoice that Dr. Fletcher's work lives after him and that he has left us a noble example to copy in his faithful, helpful, inspiring work.

REV. G. EIFRIG, a Member of the Council:—

Although I did not have the good fortune to know our late lamented Dr. Fletcher so long as some of the other speakers of this evening had, yet, the time—five years—was long enough to let our friendship ripen into a very cordial and sincere one. In fact, his character was such a lovable and unselfish one, that to know him was to love him and become a friend to him. I think his very unselfishness was the key to his great popularity and the general sorrow caused by his taking off. He was a lover of men and a lover of nature, and in this connection I may bring out another side of his many-sidedness, and that is his keenness as an observer of birds. I well recall with what pleasure he would let me know by letter or telephone when he saw the first arrivals of the spring migrants, his first song sparrow, or bluebird, or red-winged black bird, etc. In fact, he rendered some very material service to ornithology in this vicinity, for the first and only positive records of the Lapland Longspur (*Calcarius lapponicus*) and the Shore Lark (*Otocoris alpestris*) in this neighborhood were made by him in May 1890. It is my deep conviction that we have sustained a great loss, the whole country, the Experimental Farm System, Ottawa, and last, but not least, our Club.

MR. E. R. CAMERON, Registrar of the Supreme Court of Canada:—

The gentlemen who have so far addressed you this evening have been more or less associated with Dr. Fletcher's scientific work. I should like the opportunity of saying a word from what may be called a layman's standpoint or that of the amateur naturalist. I have known of Dr. Fletcher's work from a national standpoint, as every other intelligent Canadian has, and of his great services, especially to the farming community and I have been able to appreciate in a humble way the high quality of his scientific attainments. No one could know Dr. Fletcher without being compelled to say: "Here is a great man."

We find in the history of all races that at times nature produces a specially great individuality. When the history of this period comes to be written long after we have passed from the scene, Dr. Fletcher's name will stand forth prominently, and identified with the great advance in scientific agriculture and horticulture. Something has been said as to the form which a memorial to Dr. Fletcher's memory should take. Personally, I strongly prefer that we should aim at establishing a bursary or scholarship in one of our Canadian Universities to encourage research work in entomology and botany, the subjects which are identified with Dr. Fletcher's life-work. This might be styled

the Fletcher Memorial Bursary. I would recommend that before this meeting breaks up a committee be appointed to take this matter into consideration.

MR. T. J. MACLAUGHLIN:—

The various papers and addresses delivered here this evening have touched very beautifully upon almost every phase of Dr. Fletcher's works and his character, but Prof. Shutt, in describing him as a friend, has sounded another chord, and a very important one, in the anthem of praise of this good and great man, in which we are all ready and anxious to join. As one who knew Dr. Fletcher intimately for considerably more than a quarter of a century, I can heartily endorse all that Mr. Shutt has said of him as a true friend.

Dr. Johnson once said, in his criticism of one of the minor poets, that he was interesting to posterity only as a friend of another poet, and I was thinking while Mr. Shutt was speaking, that although the poet's friends considered this harsh criticism, some of us here to-night would not object to being placed in a relative position to that of the poet thus criticised and to have it said of us that we are interesting only as friends of Dr. Fletcher. For my own part I would be perfectly satisfied to be considered worthy of such a distinction. Whether I have been a friend to Dr. Fletcher or no, is not, of course, for me to say, but I can say and do know that he was a true and noble friend to me during all the years that I knew him—a friend in need and at all times, whom I loved as a brother and whose memory I shall ever dearly cherish.

Dr. Fletcher was not only a friend and companion of the learned and scientific, but of all, irrespective of position or condition in life. The high, the low, the rich and the poor met with him on common ground.

It may well be considered that the Ottawa Field-Naturalists' Club has sustained a severe loss in the death of him who was one of its founders. We old members of the Club, all well know that his great personality and enthusiasm carried it through many a severe crisis, but it is to be hoped that it is now old enough and strong enough to long survive him and continue the work to which he was so earnestly devoted.

Dr. Saunders' address on the value of Dr. Fletcher's services in connection with the Experimental Farms—his efforts in the cause of science and agriculture affords an estimate of the loss which the country has sustained in his death. Indeed it would scarcely be possible for any man to work and experiment so incessantly as Dr. Fletcher did for so many years, without making many valuable discoveries and adding much to science along the lines of his profession. I am not qualified to speak of Dr. Flet-

cher's scientific attainments or of his position in the field of science, as Dr. Saunders, Mr. Harrington, Mr. Gibson and others who have preceded me, are able to do and have done to-night, but I have had ample opportunity of observing many of the lovely qualities of his nature which are not apparent in the broadside of action, as presented to the public; those inborn permanent characteristics which neither time, nor circumstances in life can eradicate or alter, and, which endeared him to his family and friends and made his home life so happy and joyous. His pain at the distress of his friends—his pleasure at their success—his ready self-denial for their pleasure and profit—his love for little children and of innocence in every form, and a thousand other evidences of gentle soul and those rarer human virtues which only a great soul has power to arouse, constituted the adornment and great charm of his life and are now the consolation of those who knew him best and loved him most.

I was not aware that Dr. Fletcher was ill at all and the news of his death came to me in New York, where I was at the time, as a most grievous shock and surprise. He was buried before I could return. I was therefore denied the privilege of even looking upon him in death or of following his remains to the grave. I am glad, however, to be at this memorial meeting and to be allowed to add a word to the many beautiful encomiums of the evening on his life and activities, and to express the deepest regret and sorrow at his early death.

MR. WM. J. TOPLEY:—

Although it is late, I must claim a few moments to add my tribute. While I have listened to the loving words, to the glowing testimonies of his intimate associates, I am impressed with this thought; the lesson of this evening is, that Love rules the world, that we should realize that often it is just as easy to do a kindness as to neglect the opportunity; that the influence of loving deeds habitually performed is almost limitless.

My first impressions of Dr. Fletcher date from 1876. My attendance at excursions and lectures increased my admiration and later, during the work of making a photographic record of some of our forest trees, I was much interested in marking his preparation and provision to record systematically, every observation in his line of work, even those outside our work in hand. On several occasions I have brought visitors to the Experimental Farm, sometimes to obtain advice from Dr. Fletcher, and in the getting of it, was magnetized by his inspiring personality. Whatever may be the future of this institution, we of Ottawa are justly proud of the efficiency of the staff, the

uniform courtesy always in evidence and extended to the humblest applicant for information.

It was not, therefore, Dr. Fletcher's official courtesy that impressed me, it was his approachableness at all times and in all places; his every-day enthusiastic readiness to serve; his desire to give. His life was like a book lying open before you; every time you wished you could apply, could have intercourse without preface or introduction.

We have no remembrances of unkind words, his temperament was too bright. A remark by a former speaker reminds me that Dr. Fletcher once said he had no use for poets; nevertheless, Dr. Fletcher was a poet; his unequalled energy, his love for doing things led him to make a humorous protest against apparent listlessness. A poet is one who through observation and meditation distils thoughts into strong words; who weaves beautiful thoughts into songs full of Divine uplift to the human soul; thus bringing hope and joy into daily living. In this large, best, truest sense he was a poet of "sweetness and light."

At this club meeting it is natural that references should be made to the scientific side of his life, I was pleased that one of the speakers touched upon the charm of his home and family life.

Not being a member of the Club would it not be proper for me to refer to the fact that Dr. Fletcher discharged with equal enthusiasm and efficiency the social and religious duties of a citizen.

Until something better is evolved, all that is included in the word church will continue to stand for the highest moral force. This Dr. Fletcher recognized, to the benefit and appreciation of a large number of our citizens, thus rounding out an ideal life. Too many of our scientists are one-sided like all great thinkers.

When science escaped from the tyranny of ecclesiasticism the pendulum swung to the opposite, materialism; during the last twenty-five years many scientists have not only swung back again but have become spiritists.

A large number take a half-way position, claiming that the evolution of man as mirrored in nature demands a continuity of life, another environment in which the wonderful powers of the subconscious mind may be unfolded; that what we call life is always associated with what we call death.

Whatever we may think of these conclusions it seems to me that one of the strongest proofs of the Divinity of the human soul and of a future life is suggested by the untimely ending of a life so full of fruition, so full of even greater promise; the closing of the clean record of a beautiful life such as his of whom we to-night speak these words of fond remembrance.

"Those whom we love truly never die,
For death the pure life saves,
And life all pure is love, and love can reach
From Heaven to earth, and nobler lessons teach
Than those by mortals read."

"Thank God for one dead friend,
With face still radiant with the light of truth,
Whose love comes laden with the scent of youth
Through twenty years of death."

The following letter from Dr. S. B. Sinclair was read:—

It is probable that the death of no one outside the teaching profession would be mourned more deeply or sincerely by Canadian teachers and more particularly by the graduates of the Ottawa Normal School, than Dr. Fletcher. Dr. Fletcher, in addition to combining in a rare degree the qualities of the gifted scientist and the cultured gentlemen, was above all the Prince of good companions.

The students never lost an opportunity to express their appreciation of his untiring energies in their behalf and of the value of the lessons which he taught and the interest which he created.

Hundreds of teachers, when they hear the sad news, will recall a time when under the convincing and inspiring force of an eloquent and masterly address or in the never to be forgotten walk through the pathless woods they caught something of the spirit of this great man and ever after nature had to them a larger and a Diviner meaning.

DESCRIPTION OF *PSILOCORSIS FLETCHERELLA*. A NEW SPECIES OF MOTH OF THE FAMILY *ÆCOPHORIDÆ*.

BY ARTHUR GIBSON, CENTRAL EXPERIMENTAL FARM, OTTAWA.

In the Canadian Entomologist, March, 1908, the writer published, under the name of *Cryptolechia quercicella* Clemens, a note on some larvæ, which had been found feeding on *Populus tremuloides*, in the Arboretum of the Central Experimental Farm, Ottawa. On further study the moth reared from these larvæ proves to be an undescribed species of the genus *Psilocorsis*, as mentioned by Mr. August Busck in the Proceedings of the United States National Museum, Vol. XXXV, page 197, 1908. As a tri-

bute to the memory of my late Chief, and ever kind friend, from whom I always received the greatest encouragement and help in my studies, I esteem it an honour to name it

Psilocorsis fletcherella, new species.

. Alar expanse 19 mm.

Labial palpi ochreous, margined beneath and on sides with longitudinal black lines, second joint thickened with appressed scales; antennæ simple, without pecten, black, annulated with light ochreous. Face and head rust-yellow; thorax darker, with a tinge of purple; abdomen almost concolorous with thorax, lower edge of segments pale ochreous. Fore wings of a pale gold colour rather heavily dusted with pale brown and having a purplish reflection. Outer discal spot conspicuous, blackish, inner discal spot same colour but not so well defined. Cilia ochreous, darkened with brown. Hind wings: ground colour same as fore wings but only lightly dusted with pale brown. Legs bright pale ochreous, shining; tarsal joints fuscous.

Described from a single, female specimen, the type, Cat.No. 12185 U. S. N. M.

THE PUBLISHED WRITINGS OF DR. FLETCHER.

COMPILED BY ARTHUR GIBSON AND HERBERT GROH.

In the preparation of the following list of writings of the late Dr. James Fletcher, the compilers have met with many difficulties. The author had kept no list of his publications, and search had to be made in many quarters. The list cannot be considered by any means a complete one. Such a list is impossible, owing to the many agricultural and other papers to which he sent material for publication. In the *Montreal Family Herald and Weekly Star*, in his *Farmers' Friends and Foes* column, which began in 1896, he has contributed replies to hundreds of enquiries, on a great variety of subjects. A list of these could be added but it has been thought better to omit them here.

In the Annual Reports of the Dominion Experimental Farms:

Report of the Entomologist and Botanist, 1887, pp. 8-41; 1888, pp. 47-77; 1889, pp. 59-92; 1890, pp. 154-205; 1891, pp. 190-220; 1892, pp. 144-167; 1893, pp. 157-193; 1894, pp. 183-226; 1895, pp. 135-181; 1896, pp. 223-276; 1897, pp. 187-230; 1898, pp. 167-219; 1899, pp. 159-204; 1900, pp. 195-249; 1901, pp. 197-262; 1902, pp. 169-201; 1903, pp. 163-215; 1904, pp. 205-256; 1905, pp. 159-204; 1906, pp. 201-234; 1907, pp. 182-213.

In the Interim Report of the Experimental Farms, covering the period from Dec. 1st, 1905, to March 31st, 1906: Report for period and historical resumé of economic entomology in Canada, pp. 59-81.

In the Annual Report of the Minister of Agriculture, 1895: Report of investigations in Manitoba and British Columbia, as Entomologist and Botanist, pp. 10.

In the Annual Report of the Select Standing Committee on Agriculture and Colonization of the House of Commons: Evidences, 1891, pp. 13; 1892, pp. 19; 1893, pp. 24; 1894, pp. 20; 1895, pp. 18; 1896, pp. 22; 1897, pp. 17; 1898, pp. 22; 1899, pp. 20; 1900, pp. 45; 1901, pp. 25; 1902, pp. 56; 1903, no Evidence given; 1904, pp. 26; 1905, pp. 24; 1906-1907, pp. 27.

Bulletins of Experimental Farms:

No. 3. Smuts Affecting Wheat, 1888.

11. Recommendations for the Prevention of Damage by Some Common Insects of the Farm, the Orchard and the Garden, 1891.

14. The Horn Fly, 1892.

19. Grasses: Their Uses and Composition, 1893. (Jointly with Mr. Frank T. Shutt, M.A., F.C.S., F.I.C.)

22. Part II on Injurious Insects, and Part III on Potato Blights, 1895.

28. Weeds, 1897. Reprinted 1907.

37. Part of, on Apple Insects, 1901.

43. Part of, on Plum Insects, 1903.

46. Part III, on Lucerne or Alfalfa, 1904.

52. Insects Injurious to Grain and Fodder Crops, Root Crops, and Vegetables, 1905.

56. Parts of, on Insects Injurious to Currants and Gooseberries, and, on Insects Injurious to Raspberries and Blackberries, 1907.

Experimental Farm Notes No. 2: Potato Blights, 1894.

Experimental Farm Notes No. 4: The Russian Thistle, or Russian Tumble Weed, 1894.

Other Publications of the Dominion Department of Agriculture:

Reports of the Dominion Entomologist for 1884, pp. 1-7; 1885, 1-56.

Leaflet on the Clover Seed Midge, 1886.

Farm Weeds of Canada, by G. H. Clark, B.S.A., and James Fletcher, LL.D., F.R.S.C., F.L.S., with illustrations by Norman Criddle. 1906, pp. 1-103. (Text written by Dr. Fletcher).

Government of the North-West Territories:

Bulletin No. 1, Noxious Weeds and How to Destroy Them, 1898.

In the Canadian Entomologist:

Nature-printed Butterflies. Vol. XII, Jan., 1880, pp. 1-3. Also published in Annual Report, Entomological Society of Ontario. Entomology for Beginners—the Calosomas. XII, Feb., 1880, pp. 32-35.

Note on *Melitæa phæton*. XII, Aug., 1880, p. 160.

Thecla niphon. XVI, May, 1884, pp. 92-94. Also in Rep. Ent. Soc. Ont.

A Rare Sphinx Added to the Canadian List (*Pterogon clarkii*). XVII, Dec., 1885, p. 251.

Notes on the Preparatory Stages of *Carterocephalus mandan*. XXI, 1889, pp. 113-116.

Winter Collecting. XXI, 1889, pp. 15-17. Also in Rep. Ent. Soc. Ont.

The Apple Tree Tent Caterpillar. XXI, 1889, pp. 74-76. Also in Rep. Ent. Soc. Ont.

- Cutworms. XXI, 1889, pp. 117-120. Also in Rep. Ent. Soc. Ont.
 The Imported Currant Sawfly. XXI, 1889, pp. 150-152. Also in Rep. Ent. Soc. Ont.
 The Tiger Swallow-tail. XXI, 1889, pp. 201-204. Also in Rep. Ent. Soc. Ont.
 The Mediterranean Flour Moth. XXII, March, 1890, pp. 41-44. Also in Rep. Ent. Soc. Ont.
 The Northern Mole Cricket. XXIV, 1892, pp. 22-25.
 Notes on Killing, Preserving and Relaxing Insects. XXIV, 1892, pp. 14-16. Also in Rep. Ent. Soc. Ont.
 The Mottled Umber Moth. XXVI, Jan., 1894, pp. 22-24.
 Notes on Mr. E. F. Heath's Collection of Butterflies. XXVII, Nov., 1895, pp. 314-315.
 The Cigar-case Bearer of the Apple. XXVIII, May, 1896, pp. 128-130.
Argynnis idalia in New Brunswick. XXIX, April, 1897, p. 93.
Papilio ajax, var. *marcellus* in British Columbia. XXXI, Jan., 1899, p. 8.
 The Bite of *Otiorynchus ovatus*. XXXI, Jan., 1899, p. 14.
 Description of the Full-grown Larva of *Grapta j-album*. XXXII, Sept., 1900, pp. 273-276.
 Description of the Full-grown Larva of *Anacamptis lupinella*. XXXIII, Jan., 1901, pp. 15-16.
 Life-history of the Variable Cutworm, *Mamestra atlantica*, Grt. XXXIV, Nov., 1902, pp. 279-284. (Jointly with Mr. Arthur Gibson).
 Note on *Deilephila galii*. XXXV., April, 1903, p. 109.
 A New Food Plant for the Common Spring Blue Butterfly (*Cyaniris ladon*, var. *lucia*). XXXVI, Jan., 1904, p. 4.
 How do Insects pass the Winter? XXXVII, March, 1905, pp. 79-84.
 Canadian Three-color Process Illustrations. XXXVII, May, 1905, pp. 157-159.
 The Buffalo Carpet Beetle. XXXVII Sept., 1905, pp. 333-334.
 The Larva of *Eupithecia interruptofasciata*. XXXVII, pp. 262-263. (Jointly with Mr. Arthur Gibson).
 The Pupation of *Euvanessa antiopa*. XXXVIII, Dec., 1906, pp. 411-412.
 The Life-history of the Spined Rustic (*Barathra curialis*, Smith). XXXVIII, Dec., 1906. (Jointly with Mr. Arthur Gibson).
Platysamia columbia nokomis. XL, Oct., 1908, p. 373.

In the Reports of the Entomological Society of Ontario:

- An Outline Sketch of the Canadian Buprestidæ. 1878, pp. 46-84.
 Scarabæidæ—Diggers. 1879, pp. 65-71.
 On the Chief Benefits Derived by Farmers and Horticulturists from a Knowledge of Entomology. 1880, pp. 57-68.
 Necrophori—Burying Beetles. 1881, pp. 70-73.
 Homoptera—The Harvest Flies and their Allies. 1882, pp. 69-83.
 Collecting in Early Winter. 1883, pp. 31-32.
 Notes on Worms. 1883, pp. 68-76.
 The Larch Saw-fly. 1884, pp. 72-77.
 The Hessian Fly. 1886, pp. 43-45.
 Annual Presidential Address. 1888, pp. 3-13.
 A Trip to Nepigon. 1888, pp. 74-88.
 The Wheat Midge. 1888, pp. 88-91.
 Fuller's Rose-beetle. 1890, pp. 62-64.
 Annual Address as President of the Association of Economic Entomologists. 1891, pp. 36-44.

- The Northern Mole-cricket. 1891, pp. 87-90.
 The Horn-fly. 1892, pp. 49-53.
 Clothes Moths. 1892, pp. 53-58.
 Injurious Insects of 1892. 1893, pp. 8-13.
 Notes on some of the more Important Entomological Exhibits at the Chicago Exhibition. 1893, pp. 61-64.
 The Pitcher Plant Moth. 1894, pp. 44-46.
 The Gypsy Moth. 1894, pp. 67-72.
 The San José Scale. 1894, pp. 73-76.
 Injurious Fruit Insects of the Year 1894. 1894, pp. 76-81.
 The Interrelation of Insects and Flowers. 1894, p. 119. (Jointly with Mr. J. A. Guignard).
 The Value of Entomology. 1895, pp. 16-21.
 Insect Injuries of the Year 1895. 1895, pp. 31-36.
 Insect Injuries to Ontario Crops in 1896. 1896, pp. 58-69.
 The San José Scale. 1897, pp. 78-86.
 The Brown-tail Moth. 1898, pp. 72-74.
 Injurious Insects in 1898. 1898, pp. 75-87.
 Some Interesting Insects. 1899, pp. 30-32.
 The San José Scale. 1899, pp. 17-20.
 Injurious Insects of Ontario during 1899. 1899, pp. 106-111.
 Injurious Insects of Ontario during 1900. 1900, pp. 62-72.
 The Value of Nature Study in Education. 1901, pp. 21-22.
 The Painted Lady Butterfly, *Pyrameis cardui*. 1901, pp. 54-56.
 The Entomological Record. 1901, pp. 99-108.
 Injurious Insects of Ontario during 1902. 1902, pp. 80-87.
 The Pea Weevil. 1902, pp. 3-8.
 Insects Injurious to Ontario Crops. 1903, pp. 62-71.
 Biographical Sketch (with portrait) of Rev. G. W. Taylor. 1903, pp. 108-109.
 Insects Injurious to Ontario Crops during 1906. 1906, pp. 81-86.
 The Entomological Record. 1902, pp. 87-98.
 The Entomological Record. 1903, pp. 85-89.
 The Entomological Record. 1904, pp. 56-78.
 Insects Injurious to Ontario Crops in 1904. 1904, pp. 49-56.
 Notes on Mrs. Nichol's paper (On Butterfly Collecting in Canada). 1905, pp. 79-80.
 Insects Injurious to Ontario Crops in 1905. 1905, pp. 81-90.
 The Entomological Record. 1905, pp. 90-105.
 The Entomological Record. 1906, pp. 86-104. (Jointly with Mr. Arthur Gibson).
 Insects Injurious to Ontario Crops. 1906, pp. 81-86.
 The Entomological Outlook. 1907, pp. 9-15.
 The Entomological Record. 1907, pp. 113-133. (Jointly with Mr. Arthur Gibson).

In the Transactions of the Ottawa Field-Naturalists' Club:

- Inaugural Address as President. 1879, I., pp. 12-22; 1880, II, pp. 8-21; 1881, III, pp. 11-19; 1882, IV, pp. 11-21.
 Flora Ottawaensis. 1879, I, pp. 48-61.
 Notes on the Flora Ottawaensis, with Special Reference to the Introduced Plants. 1883, Vol. II, No. 1, pp. 29-37.

In the Ottawa Naturalist:

- Flora Ottawaensis, 2nd Edition (not yet complete). 1888, pp. 1-98.
 Short Instructions for Collectors Away from Home. Vol. III, April, 1889, pp. 8-9.

- Educational Value of Botanic Gardens. V, 1891-92, pp. 105-113.
 Fall Webworm. VI, 1892-1893, pp. 70-71.
Brephos infans at Ottawa. VIII, p. 43, 1894.
 Entomological Notes—The Sumach Gall; *Eacles imperialis*; *Catocala relictæ*; *Anisota virginienensis*. VIII, pp. 117-118, 1894.
 Botanical Notes—*Hypopitys lanuginosa*; *Corallorhiza striata*; *Podostemon ceratophyllus*; *Phragmites communis*. VIII, 1894, pp. 118-121.
 Note on *Erebia discoidalis*. IX, July, 1895, p. 92.
 Note on *Asplenium Ruta-muraria*. IX, Nov., 1895, p. 171.
 Note on The Common House Mouse, *Mus musculus*. IX, Nov., 1895, p. 171.
 Note on *Pamphila peckius*. IX, Nov., 1895, p. 171.
 Note on *Sphinx luscitiosa*. IX, Nov., 1895, p. 172.
 Botanical Notes—*Sisymbrium Alliaria*; *Cypripedium aristinum*; *Arethusa bulbosa*; *Listera australis*; *Habenaria fimbriata*; *Trillium grandiflorum*; *Camelina sativa*. X, July, 1896, p. 86.
 A Butterfly-catching Spider. X, Nov., 1896, p. 151.
 Botanical Note—*Ribes ciliolum*. XIII, June, 1899, p. 75.
 Manitoba's Wild Flowers. XIV, April and May, 1900, p. 19.
 Note on Jewel Weed. XIV, Sept., 1900, p. 120.
 A Hint to Gardeners. XIV, Sept., 1900, p. 120.
 Note on *Pieris protodice*. XV, Oct., 1901, p. 161.
 Note on Macrae's Coral-Root. XVII, July, 1903, p. 76.
 Nature Study. XVII, May, 1903, p. 45.
Matricaria inodora. XVII, Nov., 1903, pp. 143-144.
 Alum Root as a Remedy for Diarrhœa. XVIII, June, 1904, p. 76.
 The Clouded Sulphur Butterfly (*Colias philodice*). XIX, May, 1905, pp. 59-62.
 Note on *Erythronium albidum*. XIX, June, 1905, p. 68.
 Botanical Notes—The Fruit of *Epigæa repens*; Rare Ottawa Plants. XIX, August, 1905, p. 110.
 School Exhibits of Pressed Plants. XX, Nov., 1906, p. 173-176.
 Botanical Note—Fruit and Seed. XX, Nov., 1906, p. 161.
Leucobrephos middendorfi. XXI, July, 1907, p. 67.
 Mountain Sprites. XXI, March, 1908, pp. 225-231.
 The Honey Bee and other Bees. XXI, Feb., 1908, p. 213.
 Two Newly Introduced European Plants. XXII, July, 1908, p. 80-81.
 A Black Fruited Thorn in Ontario. XXII, Nov., 1908, p. 164.

In the Transactions of the Royal Society of Canada:

- Presidential Address, 1895, on Practical Entomology.
 Recent Additions to the List of Injurious Insects of Canada. 1899.
 The Value of Nature Study in Education. 1901.
 Descriptions of Some New Species and Varieties of Canadian Butterflies. 1903. Reprinted in Canadian Entomologist, Vol. XXXVI, May, 1904, pp. 121-130.
 Notes on the Preparatory Stages of Some Species of Canadian Lepidoptera. 1907. (Jointly with Mr. Arthur Gibson).

In the Report of the Geological Survey of Canada:

- List of Diurnal Lepidoptera of the Yukon District, Northern British Columbia and Mackenzie River. 1887, pp. 229-231B.

In "Instructions to Canadian Pacific Railway Land Examiners" (Winnipeg, Man.), 12mo.:

- Botanical Collections. pp. 24-27.

In Insect Life (Department of Agriculture, Washington, D.C.):

- Preliminary Note upon *Chionobas macounii*. II, 1889, pp. 45-46.
 Mediterranean Flour-moth. II, 1889, pp. 187-189.
 Notes upon Injurious Insects of the Year in Canada. III, p. 247.
 President's Inaugural Address, 3rd Annual Meeting Association of Economic Entomologists. IV, 1891, pp. 4-16.
 Notes on Injurious Insects in Canada in 1892. V, Nov., 1892; pp. 124-126.

In Entomologica Americana:

- Annual Address of President of the Entomological Club of the A. A. S., 1889. 1900, Jan., pp. 1-8.

In the Proceedings of the Association of Economic Entomologists:

- Notes from Canada. Bull. 26, New Series, Division of Entomology, U.S. Department of Agriculture, 1900.
 Injurious Insects of the Year in Canada. Bull. 40, Division of Entomology, U.S. Department of Agriculture, 1903.
 Insects of the Year in Canada in 1903. Bull. 46, Division of Entomology, U.S. Department of Agriculture, 1904.

In the Farmer's Advocate:

- The Clover-root Borer. 1891, p. 387.
 Articles on Injurious Insects (I-XI). 1892, pp. 18, 58, 147, 198, 231, 308, 348, 395, 439, 479; 1893, pp. 10, 50.
 Clothes Moth. 1893, p. 149.
 Does Wheat turn to Chess? 1893, p. 167.
 Granary Weevils. 1893, p. 423.
 Injurious Insects. 1894, p. 157.
 Insects Injurious to Farm Crops in Canada in 1896. 1897.
 Carpet Beetle or Buffalo Moth. 1897.
 Injurious Insects: San José Scale—The Army Worm. 1897, April 1st.
 Injurious Insects: Spraying—Spring Work. 1897, April 15th.
 The Flour Mite. 1900, March 1st.
 Red Spider Injuries (in Manitoba). 1900, Oct. 15th.
 A Cattle Tick (*Boophilus bovis*?) 1900, May 1st.
 Hessian Fly and Joint Worms. 1906, Oct. 4th.
 Calendar Guide to Spraying. 1907, p. 532.
 Uniform Formula for Lime-sulphur Mixture. 1907, p. 533.
 The Larder or Bacon Beetle. 1907, July, p. 1206.
 Calendar Guide to Spraying, 1908, March 26th, p. 549. (Jointly with Mr. W. T. Macoun.)
 Uniform formula for Lime-Sulphur Mixture. 1908, March 26th, p. 550.
 Insects that trouble Vegetables and How to combat them. 1908, May 7th.

In The Nor'-West Farmer:

- Collecting Botanical Specimens. 1892, p. 196.
 Invasion of Box Elder Bug (*Leptocoris trivittatus*). 1901, Nov. 5th, p. 694.
 A Currant Maggot (*Epochra*?) 1901, Dec. 5th, p. 751.
 Getting Rid of Bed Bugs. 1905, Sept. 20th.

In the Montreal Family Herald and Weekly Star:

- The Hessian Fly. April 3rd, 1901.
 The Pea Weevil. April 17th, 1901.
 Fleas and Bed Bugs. May 20th, 1901.

- Black Vine Beetle, attacking Strawberries. May 30th, 1901.
 The Powder Post Beetle. Nov. 6th, 1901.
 The Peach-tree Borer. Nov. 13th, 1901.
 Ants in Houses. Nov. 20th, 1901.
 The Hawk House-fly (*Olfersia americana*). Dec. 11th, 1901.
 The San José Scale in Ohio and Ontario. Dec. 18th, 1901.
 Injurious Insects of the Year. Oct., 1902.
 The Pea Weevil. March 25th, 1903.
 The Eyed Elater. August 12th, 1903.
 The Carolina Praying Mantis. Oct. 14th, 1903.
 Fodder Crops of the North-West. Nov. 25th, 1903. (Continued in issue of Dec. 2nd).
 The San José Scale. April 6th, 1904.
 Alfalfa in the Canadian North-West; Growing Brome Grass. May 4th, 1904.
 Injurious Insects of the Year. Nov. 9th, 1904.
 The Rusts of Wheat. Nov. 30th, 1904.
 The Pea Weevil—A Warning. April 5th, 1905.
 The White-marked Tussock Moth. April 26th, 1905.
 Dangers of Sowing Foul Seed Grain. March 7th, 1906.
 Spraying and Spray Mixtures. April, 1906.
 The Brown-tail Moth. April 24th, 1907.

In the Montreal Witness:

- Asparagus Beetles. 1902, Aug. 5th.
 The Buffalo Moth. 1902, Sept. 16th.

In the Annual Reports of the Fruit Growers' Association of Ontario:

- Insects Injurious to Fruit. 1902, pp. 54-55.
 Insects and Fungous Diseases of 1903. 1903, pp. 103-106.
 Insects Affecting House Plants. 1903, pp. 155-158.
 What the Little Bee is Doing. 1904, pp. 90-96.

In the Annual Report of the Bee Keepers' Association of Ontario:

- The Value of Bees in Orchards. 1901, pp. 56-63.

In Proceedings of a Convention of Fruit Growers of the Dominion of Canada, Ottawa, Feb., 1890:

- Injurious Insects Affecting Fruits—Remedies to Prevent their Ravages. pp. 71-74.

In the Annual Reports of the Canadian Seed Growers' Association:

- Co-operation in Improving Seed for Crops. Second Annual Report, 1906, pp. 103-106.
 The Place of the Canadian Seed Growers' Association in the Campaign against Weeds. Fourth Annual Report, 1908, pp. 76-78.

In O. A. C. Review (Guelph):

- The Study of Insects an Essential Part of Farming. 1908, May, pp. 423-426.

In the Annual Report of Nova Scotia Department of Agriculture, 1907:

- The San José Scale.
 The Gypsy Moth.
 The Common Parasites Affecting Sheep.

In Weekly Globe and Canada Farmer:

- Insects and House Plants. 1907, June 19th.

PROPOSED PERMANENT MEMORIAL TO DR. FLETCHER.

The committee appointed by the Club to consider the suggestions made at the Memorial Meeting that a permanent memorial should be erected to the memory of Dr. Fletcher has prepared a letter to be issued to societies and individuals who may have been interested in his work. The letter has been approved by the Club and reads as follows:—

You have no doubt heard with regret of the death of Dr. James Fletcher, Entomologist and Botanist of the Dominion Experimental Farms, which occurred after a short illness at Montreal, Nov. 8th, 1908.

Dr. Fletcher not only did most excellent work for the country in his official capacity, but, as is well known, took a most active part in encouraging the study of Natural History in its broadest aspects throughout the Dominion.

His activities in this connection have been widely recognized and greatly appreciated by scores of students and others who have benefited by his timely assistance and warm encouragement. He was always in requisition as a lecturer by Normal Schools, Natural History and other Societies; for he had gained a wide popularity as a charming and exceedingly instructive speaker.

The Ottawa Field-Naturalists' Club, of which Dr. Fletcher was one of the founders, have thought that his life work was of such a national character that a permanent tribute to his memory should be made. Such a memorial would not only serve to commemorate for all time the good work done by Dr. Fletcher, but would also act as a stimulus to future generations in the study of the fauna and flora of Canada.

Several suggestions have been made as to the form the memorial should take, namely:—

- (a). A fountain at the Central Experimental Farm.
- (b). A statue to be placed in the grounds of the new Natural History Museum.
- (c). A bust or portrait to be placed in that building, or at the Central Experimental Farm.
- (d). To found a bursary at some Canadian University.

Of necessity no decision can be reached until it is known, approximately at least, what amount of money can be raised.

The Council has appointed the members hereafter named to be a Committee to ascertain what response might be forthcoming to an appeal for contributions toward such a memorial.

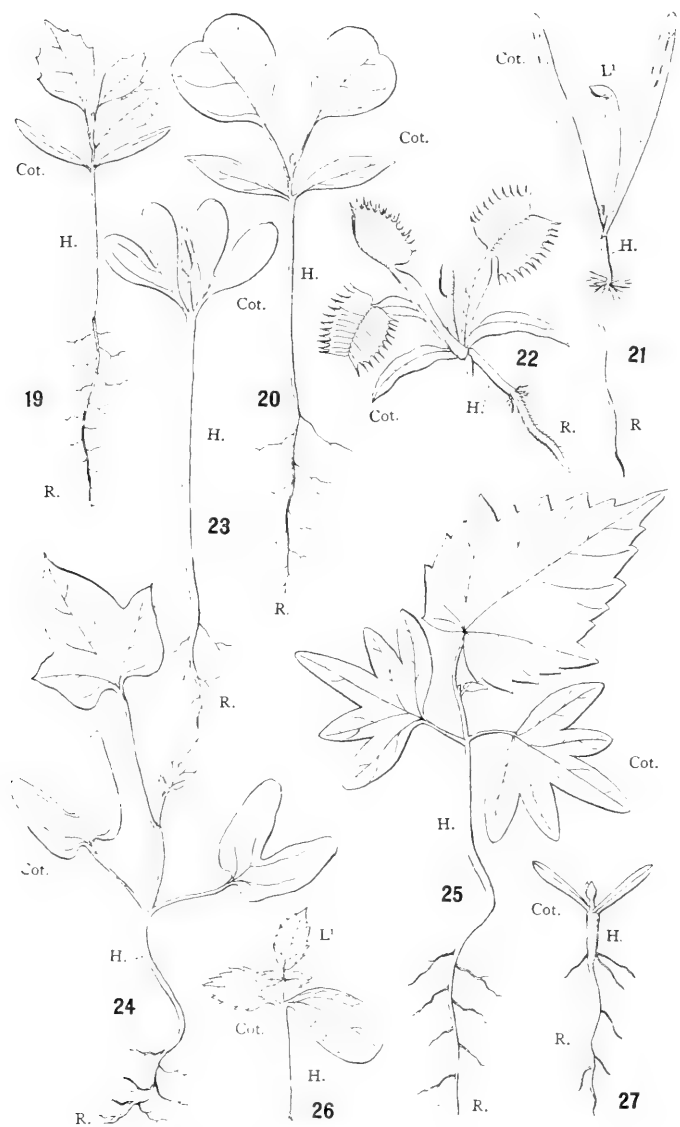
Will you kindly state on the enclosed form the amount you are agreeable to subscribe to this fund and return it at your earliest convenience to the Secretary.

COMMITTEE:—A. E. Attwood, M.A., President O.F.N.C.; T. E. Clarke, B.A., Secretary O.F.N.C.; Arthur Gibson, Treasurer O.F.N.C.; W. Saunders, C.M.G., LL.D., F.L.S., F.R.S.C., Director of Dominion Experimental Farms; W. Hague Harrington, F.R.S.C.; E. R. Cameron, M.A., K.C.; R. B. Whyte, Vice-President Ontario Horticultural Association; Frank T. Shutt, M.A., F.I.C., F.C.S., F.R.S.C.; A. McNeill, Chief of Fruit Division, Dept. of Agriculture; H. M. Ami, M.A., D.Sc., F.G.S., F.R.S.C.

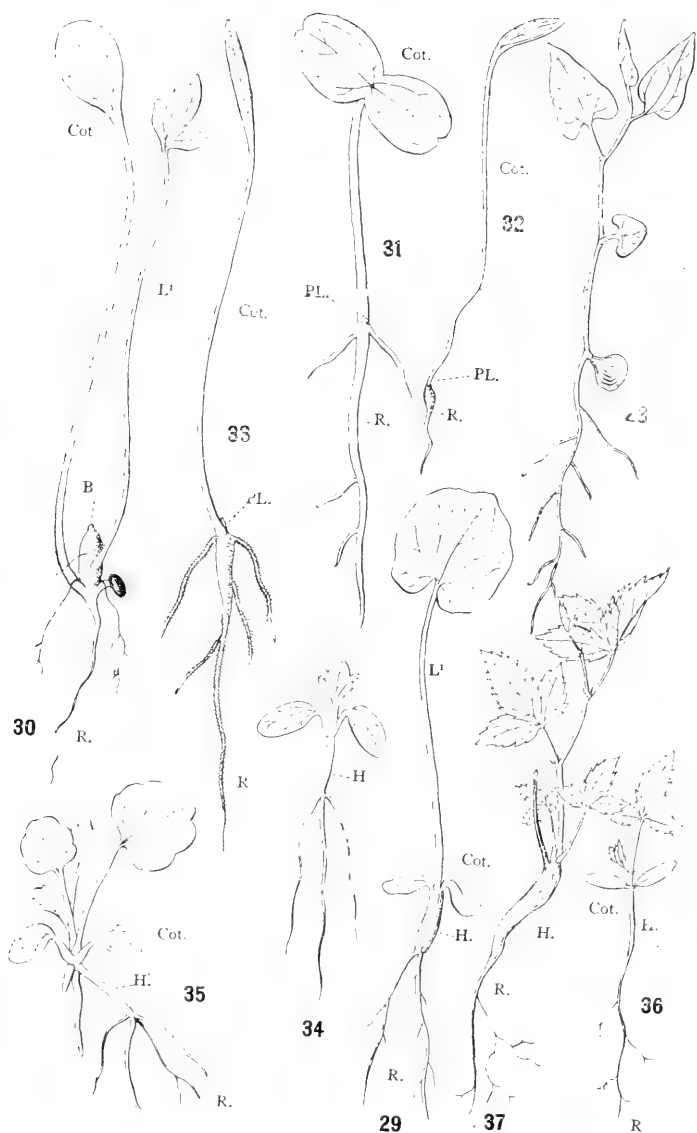
Signed on behalf of the Committee,

E. R. CAMERON, *Chairman.*

W. HAGUE HARRINGTON, *Secretary.*



SEEDLINGS OF PHENOGAMOUS PLANTS.



SEEDLINGS OF PHÆNOGAMOUS PLANTS.

THE OTTAWA NATURALIST

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No. 11

OBSERVATIONS ON SEEDLINGS OF NORTH AMERICAN PHÆNOGAMOUS PLANTS.

By Theo. Holm, Brookland, D.C.

(Continued from page 174).

In passing to describe some types of dicotyledonous seedlings, it might be stated at once that the majority of these possess epigeic cotyledons. There is, thus, a well marked distinction between the two classes *Monocotyledones* and *Dicotyledones*, consisting not only in the number of cotyledons, but also in the structure of these depending upon the different function which they have to perform. We have seen that in very many, really in most of the *Monocotyledones* the cotyledon has acquired a certain shape and internal structure for absorbing the endosperm, for instance the scutellum in *Gramineæ*, and the club-shaped organ in *Smilacæ*, *Commelinacæ*, *Scitamineæ*, etc., instead of being developed as a free, assimilating leaf as in *Alisma*, *Agave*, *Sisyrinchium*, etc. Such peculiar modifications of the cotyledonary leaves are not known from the *Dicotyledones*; in these they generally have the same function to perform as the proper leaves, to assimilate, or, sometimes, they are also the bearers of reserve food-substances, and are then either epigeic or hypogeic, especially the latter. Another striking contrast between these two classes is the usually much stronger development of the primary root, and of the hypocotyl in the *Dicotyledones*. Moreover, these two organs have, in the *Dicotyledones*, very often acquired a certain structure in accordance with their functions; for instance the primary root may be developed as a storage root, and the hypocotyl may, sometimes, attain quite a considerable increase in thickness and contain abundant deposits of food material, or its function may simply be to raise the cotyledons above the ground, thus liberating them from the seed-coat. In the *Monocotyledones*, on the other hand, the primary root seldom persists, and hardly ever as a storage root, and the hypocotyl is seldom developed to any great extent, and shows no modifica-

tion to be compared with the one so frequently observed in the *Dicotyledones*. One of the most striking peculiarities noticeable in the seedlings of the *Dicotyledones* is the remarkable contrast between the shape of the cotyledons, especially the epigeic, and the final leaves, and it seems almost impossible to bring these into actual correlation. The diversity of form in the cotyledons is quite considerable, even if their shape be usually much simpler than that of the ultimate leaves, a simplification which may have been produced by arrest, rather than being an indication of leaf-forms that characterized the species in by-gone years, as suggested by some authors. Considered by themselves the epigeic cotyledons represent a multitude of forms, of which the following may be enumerated: "linear" in *Claytonia megarhiza* Parry, *Menispermum Canadense* L., *Negundo aceroides* Moench, *Acer saccharinum* Wang; "narrow lanceolate" in *Platanus occidentalis* L.; "ovate" in *Vitis riparia* Michx., *V. astivalis* Michx., *Ampelopsis quinquefolia* Michx., *Clitoria Mariana* L.; "obovate" in *Rhus copallina* L.; "obovate with auriculate base" in *Carpinus Caroliniana* Walt.; "oblong" in *Cornus florida* L., *Celastrus scandens* L., *Liquidambar styraciflua* L.; "elliptic" in *Diospyros Virginiana* L., *Liriodendron tulipifera* L., *Sanicula Marylandica* L., *Thaspium barbinode* Nutt.; "spathulate" in *Ambrosia trifida* L.; "oval" in *Rhus Toxicodendron* L.; "reniform" in *Hedeoma pulegioides* Pers., *Geranium maculatum* L.; "rotund" in *Cassia chamaecrista* L.; "bifid" with diverging broad globes in *Ipomœa leptophylla* Torr., *I. hederacea* Jacq.; "bifid" with diverging linear lobes in *Eschscholtzia Californica* Cham.; "palmately five-lobed" in *Tilia Americana* L., and finally "bipartite with diverging rounded lobes", making the leaf almost obcordate as in *Catalpa bignonioides* Walt. (Fig. 23); in *Aralia spinosa* L. (Fig. 26) the cotyledons are very unequal, the one being obovate, and entire, the other ovate with the margins serrate, thus imitating the outline of the leaflets of the mature tree; such distinction in structure is, otherwise, very seldom met with, while some modification in size, but not in outline, has been observed in cotyledons of several herbs. We have, thus, in the epigeic cotyledons a number of leaf-types which correspond with those of mature plants, herbs and trees, with the only exception, so far as I know, of the decomposed. If we, on the other hand, examine the hypogeic cotyledons we notice in these hardly any variation worth speaking of, since these mostly remain enclosed by the seed; they are usually fleshy, entire, and vary only in length and width, from linear to oblong, etc.

To classify the dicotyledonous seedlings is a most difficult task, difficult to the same extent as it is to classify the mature

plants within the frame of biologic types, where the organs of vegetative reproduction, and especially the subterranean, play such an important role. We might classify the seedlings in accordance with the position of the cotyledons, epigeic or hypogeic, and in accordance with the function of the hypocotyl; when the hypocotyl persists, the primary root generally stays active, but when it dies off, the root becomes replaced by secondary, which may develop from the node of the hypocotyl. Another modification may be noticed in the relative development of the primary root as an organ for storing nutritive matters for instance, sometimes accompanied by the more or less complete suppression of one of the cotyledons. Finally, the singular formation of a cotyledonary tube deserves, also, attention from a biologic point of view; besides that it has been made the subject of a most interesting treatise by Miss Ethel Sargent for defining the comparative antiquity of *Monocotyledones* and *Dicotyledones*.

The most simple type of dicotyledonous seedlings is undoubtedly the one in which the primary root persists, and stays as a nutritive root, and in which the main function of the hypocotyl is to raise the cotyledons above the ground, thus exposing them to the full effect of the sunlight. In this type the hypocotyl is straight and attains often a considerable length, much exceeding that of the subsequent internodes of the seedling; moreover, the hypocotyl does not increase in thickness beyond the continuous growth of the stele, the parenchymatic tissues remaining mostly unchanged. This type is exhibited by the majority of our trees and shrubs, furthermore by most of our herbs, and is evidently the most common. Some examples illustrating this type of seedlings may be seen in the accompanying plate, where *Platanus occidentalis* (Fig. 19), *Liriodendron* (Fig. 20), *Catalpa* (Fig. 23), *Ipomœa hederacea* (Fig. 24), and *Tilia Americana* (Fig. 25) have been drawn. These seedlings show, also, another point of interest, namely, the peculiar shape of the cotyledons, and the diversity in foliage when compared with the leaves of the mature plants.

As the second type, may be mentioned *Claytonia megarrhiza* (Fig. 27). In this the seedling is very small, and has the cotyledons raised above ground by a short hypocotyl; the primary root is long, and at first slender with a few ramifications, which are very hairy. At this stage two leaves, succeeding the cotyledons, are already visible, and the seedling is now ready to winter over. At the end of the first season the hypocotyl shows a distinct wrinkling by which the apical bud becomes pulled down beneath the surface of the ground, while the root continues its growth

vertically and to a very considerable depth. In the following spring the leaves develop, forming a small rosette, while the hypocotyl, and the base of the root commence to increase in thickness, resulting finally in the formation of the very large root which characterizes the species. The plumule develops only a very short axis, and a few leaves, which winter over, and these become then succeeded by a small rosette surrounding the terminal bud, which is purely vegetative, the axis being a monopodium. A similar structure of the hypocotyl and primary axis may be observed in *Geranium maculatum* L. In this the hypocotyl increases in thickness so as to form a roundish tuber, and the apex of the axis is, also, here vegetative, developing a few leaves during the first season; the primary root persists, but does not increase in thickness to such an extent as in *Claytonia*. The seedling of *Baptisia tinctoria* R. Br., shows the same contraction of the hypocotyl and root as observed in *Claytonia*, but the primary shoot dies down to the cotyledons, and the vegetative reproduction is secured by the development of two overwintering buds, located in the axils of the cotyledons. In *Gillenia trifoliata* Moench (Figs. 36-37), in *Ceanothus Americanus* L., and *C. ovatus* Desf., the hypocotyl simply makes a bend toward the surface of the ground, and cotyledonary buds are, also, developed in these species, one in *Gillenia*, but two in *Ceanothus*, which replace the primary axis above the cotyledons; in these the hypocotyl and primary root persist for several years. We have, thus, in this type a hypocotyl whose function is first to raise the cotyledons and plumule above the ground, and afterwards either by contraction or simply by a bend to bring the overwintering bud or buds nearer to the ground for protection against the cold.

A third type is represented by *Ranunculus abortivus* L. (Figs. 34 and 35); in this the hypocotyl raises the cotyledons above ground, but soon afterwards it bends downward (Fig. 35) and dies off, together with the primary root. However, just before the hypocotyl and primary root cease to be active, a new root-system becomes developed from the cotyledonary nodus, and these secondary roots soon attach the seedling to the ground and nourish it. A mature specimen of this species, thus, lacks a tap-root; this manner of germinating was, also, observed in *R. recurvatus* Poir., and is undoubtedly common to several other species of the genus. The same is, furthermore, the case with *Sanicula Marylandica* L., while in several other Umbelliferae, e.g. *Thaspium barbinode* Nutt., *Osmorhiza longistylis* DC., etc., the primary root develops as a persistent taproot with rapid increase in thickness. Somewhat different from this type is the germination of *Sarracenia purpurea* L., in which a very distinct tuft of long hairs develop at the base of the hypocotyl where the

primary root begins; but also here the hypocotyl and primary root are of short duration as in *Ranunculus*. *Dionæa muscipula* Ellis (Fig. 22) belongs to the same type, and differs from most of the other Droseraceæ by the presence of a distinct primary root, which aborts in most of these. It is interesting to notice that the first leaf succeeding the cotyledons already shows the peculiar structure so very characteristic of *Sarracenia* and *Dionæa*.

In these types, mentioned above, I have shown some of the most striking modifications observable in the hypocotyl and the primary root, while the cotyledons themselves merely differ in respect to their shape. In the subsequent types, on the other hand, we shall see that some modification may, also, be noticed in these. Let us begin with *Dentaria laciniata* Muehl. (Fig. 30). Of the two cotyledons only one becomes raised above ground by means of its long petiole, while the other one is short-petioled with the blade enclosed by the seed*; the blade of the green cotyledon is obovate, large in proportion to the size of the seedling. We notice, furthermore, the short, slender primary root, which persists only through the first season. The hypocotyl is very short, and the plumule soon develops into a small, conical tuber, of which the first leaf generally pushes out during the first season as a long-petioled leaf with a green, mostly bicleft blade. In regard to the secondary roots, these show a very rare position since they break out from the axils of the cotyledons, one from each. In this way *Dentaria laciniata* represents a very interesting type of seedling, dicotyledonous, it is true, but with the normal development of only one of these. The European species of *Dentaria* are, also, interesting, since both cotyledons are hypogeic in *D. pinnata* Lam., but epigeic in *D. bulbifera* L., and *D. digitata* Lam. From this we learn that the structure of cotyledons may be very distinct even among closely related species.

A still more remarkable type is exhibited by *Podophyllum peltatum* L. (Fig. 31) in which the long petioles of the two cotyledons form a tube at the base of which the plumule is located; the primary root is well developed, and persists for several years. During the first season the seed-leaves are the only ones of the plant that are visible, the plumule staying dormant until next spring. This type is known from several other plants, and Miss Sargent has given quite a comprehensive list of these, from which the following may be enumerated: Several species of *Anemone*, *Trollius*, *Eranthis*, *Delphinium*

* A similar case has been observed and described by Hill in geophilous species of *Peperomia*.

nudicaule, *Aconitum Anthora*, *Leontice vesicaria*, tuberous species of *Oxalis*, *Megarrhiza Californica*, species of *Smyrniun*, *Bunium luteum*, *Chærophyllyum bulbosum* (but not *Ch. procumbens*), *Dodecatheon*, species of *Polygonum*, and *Rheum*, and one of the *Compositæ*, namely *Serratula radiata*. However, as stated by Miss Sargent, short petiolar tubes are not uncommon among the seedlings of species allied to those enumerated above, for instance: *Ranunculus millefoliatus*, *Ferula fetida*, *Serratula tinctoria*, *Rheum officinale*, etc.; these link the numerous species, in which the cotyledons are merely connate at the base, with those in which the cotyledonary tube is fully developed, and their existence is a strong argument for the derivation of such tubes from the fusion of two cotyledons.

As the last type of seedlings with epigeic cotyledons may be mentioned the so-called *Pseudo-monocotyledones*. Characteristic of these is the development of only one of the two cotyledons, the other one being completely suppressed. Members of this type are *Claytonia Virginica* L. (Fig. 33), *Erigenia bulbosa* Nutt. (Fig. 32) and *Dicentra Cucullaria* D.C. To these may be added, according to Miss Sargent: *Corydalis solida*, *C. cava*, *C. fabacea*, *Carum bulbocastanum*, *Cyclamen persicum* and *Pinguicula vulgaris*. In *Erigenia* the primary root soon commences to increase in thickness so as to form a round, tuberous body, and the single cotyledon, which consists of a long petiole and a simple, green blade is the only leaf that appears above ground during the first year. *Claytonia Virginica* germinates in the same way, but in this a leaf may appear in the first season, alternating with the cotyledon, and with the base partly surrounded by the sheath of this. *Dicentra Cucullaria* is described by Irmisch, and the cotyledon of this species possesses a blade with three very distinct divisions, a structure which otherwise is very seldom met with in cotyledons; it is the more peculiar since the blade of the cotyledon in the species of *Corydalis* is entire. It seems to be characteristic of these *Pseudo-monocotyledones*, with the exception of *Pinguicula*, that the subterranean organs (base of petiole, hypocotyl, or root) are more or less tuberous.

In passing now to describe some types of seedlings in which the cotyledons are hypogeic, I wish to state that even if this manner of germinating be very distinct from the one in which these leaves are epigeic, there are, nevertheless, some plants which exhibit a kind of transition between both. For instance, if we compare the cotyledons of *Phaseolus vulgaris*, which at first are hypogeic, but later on become epigeic and green, with those of *Phaseolus multiflorus*, which are hypogeic and pale, but turn green, when artificially exposed to the sunlight.

Very remarkable is the seedling of *Jatropha multifida* L., of which the cotyledons are distinctly petioled and by a long hypocotyl raised above ground, but of which the cotyledonary blades remain enclosed by the seed. In certain species of *Clematis* (*C. recta*) the cotyledons are normally hypogeic, but at times become epigeic.

Hypogeic cotyledons may remain enclosed by the seed all the time, or they might become freed from this and appear then as a pair of small, fleshy, pale leaves. Herbs as well as trees exhibit this manner of germinating, and characteristic of all is that the function of the cotyledons is only to be the bearers of reserve food-substances. The relative development of the primary root is somewhat different; furthermore, the hypocotyl, and the petioles of the cotyledons.

An interesting type is represented by *Megarrhiza Californica* Torr. In this plant the primary root does not commence to grow until the cotyledonary petioles have buried themselves deep in the ground, and these petioles are not only very long, but they are, furthermore, united so as to form a long tube, clothed with hairs which perform the same function as root-hairs.

Another type is characteristic of certain aquatics, e.g. *Nuphar*, *Nymphæa* and *Victoria*, in which the primary root increases but very little in length during the first stages of germination, its function becoming performed by a wreath of very long root-hairs developing from the base of the root as soon as the seed germinates. In *Nelumbium*, on the other hand, the root stays rudimentary, and does not even produce the wreath of hairs, so very characteristic of the others.

Sometimes the hypocotyl is well differentiated as in *Sanguinaria Canadensis* L. (Fig. 29), and we have here an interesting type with a persisting primary root (at least for some years), and a hypocotyl which by growing in thickness becomes the first joint of the large, horizontally creeping rhizome; the fleshy cotyledons soon leave the seed, but without being raised above ground. Furthermore, in this type the first leaf succeeding the cotyledons develops already during the first year, and shows the outline of the blade broadly cordate, and entire, instead of being prominently lobed as the final leaves. In *Phryma Leptostachya* L. the cotyledons do not leave the seed, and the hypocotyl is very short; the primary root develops as a long, somewhat fleshy root, which persists for some years. *Phryma* lacks a proper rhizome in the stricter sense of the word, since the vegetative reproduction is simply secured by cotyledonary buds in the first year, and later on by buds, which develop in the axils of the basal, scale-like leaves of the aerial shoot; it is a

kind of rhizome which has been called a "pseudo-rhizome," and is known from many plants, especially with epigeic cotyledons, *Galium* for instance. To this type belongs, also, *Aristolochia Serpentaria* L. (Fig. 28), where the cotyledons remain enclosed within the seed; where the primary root is well developed, but where there is no hypocotyl, and finally where the vegetative reproduction is effected by only one bud arising from the axil of one of the cotyledons. *Aristolochia* differs from *Phryma* in another respect, by the first leaf succeeding the cotyledons being scale-like, instead of showing approximately the same structure of the final leaves as in *Phryma*.

The most frequent type is, however, the one in which the cotyledons may or may not remain within the seed, and where the primary root develops as a strong persisting root supporting the aerial, woody stem, as in many trees of various genera. *Sassafras*, *Lindera*, *Quercus*, *Aesculus*, *Prunus*, etc. In these the primary shoot remains as the only one, no cotyledonary buds being developed, and the earliest leaves may possess a distinct blade, or they may be developed merely as small, scale-like organs as in *Carya*, *Juglans*, *Sassafras* and others.

Finally may be mentioned the very singular seedlings of *Persea gratissima* Gärtn., and *Garcinia Cochinchinensis* Choisy. In the former the cotyledons are very large, and remain enclosed, each subtending an axillary bud, ready to develop, if the plumule should become injured. The plumule bears in this species two pairs of opposite leaves with petioles and small blades, while the succeeding five or six leaves are almost scale-like, and very different from the ultimate. *Persea* thus demonstrates the fact that in seedlings with enclosed hypogeic cotyledons, there may be an alternation of various forms of leaves, while in *Juglans* and *Carya*, for instance, all the first leaves are scale-like.

Still more remarkable is the seedling of various members of the *Guttiferae*, especially of *Garcinia Cochinchinensis* Choisy. No cotyledons are developed, and the primary root soon dies off being replaced by a few very strong secondary roots, developing from the apex of the very large, bean-shaped hypocotyl. In this type the hypocotyl contains a broad parenchyma traversed by numerous resiniferous ducts, and filled with deposits of starch.

These dicotyledonous seedlings, thus, illustrate no small variation in respect to the development of cotyledons, hypocotyl, and root; furthermore, in regard to the young foliage succeeding the cotyledons. We have seen that in many trees, for instance *Carya*, *Sassafras*, *Quercus*, etc., the earliest foliage consists merely of scale-like leaves, while in *Liriodendron*, *Catalpa* *Platanus*

Tilia, etc., the leaves possess petioles and blades, but frequently of an outline very distinct from that of the final leaves. In *Liriodendron* for instance, the earliest leaves are very different from those of the mature tree; they are roundish to obovate, or even obcordate, and in the mature tree this simple type of leaf occurs only at the very apex or base of the branches. The study of this, frequently very striking, variation in foliage affords much of interest, not only from a morphological point of view, but also, and quite especially, because many of these seedling-leaves may be looked upon as still representing the foliage of ancestral types.

In the present paper I wished only to call attention to some of the most salient points observable in the seedlings, so far as concerns the external structure of their organs, and it is readily to be seen that even if the number of types is not very large, these seedlings nevertheless illustrate several interesting characteristics, indicating to some extent the future growth of the species. The study of mature rhizomes is often very difficult, when the seedling stage is not known; for instance, when the reproduction depends upon the cotyledonary buds; when the hypocotyl or the primary root, or both, actually become the first visible indication of the rhizome in its many, and highly differentiated modifications. It is, therefore, necessary to study our plants from this point of view, and I hope the few types which I have described may prove helpful in this respect. The literature upon the subject is very extensive, but there are some works in which very complete lists of papers have been compiled, and among these may be mentioned: *Beiträge zur Morphologie und Biologie der Keimung* by Klebs (1), and, *A theory of the origin of Monocotyledons* by Miss Sargent (2). In regard to the Grass-embryo there is a very comprehensive paper by Aug. Schlickum: *Morphologischer und anatomischer Vergleich der Kotyledonen und ersten Laubblätter der Keimpflanzen der Monokotylen* (3), in which the reader will find a well drawn comparison between the various theories that have been expressed in regard to this very complicated structure.

(1). *Untersuch.* Bot. Institut, Tübingen, 1881-1885, p. 536.

(2). *Ann. of Botany*, Vol. 17, 1903, p. 1.

(3). *Bibliotheca Botanica* Stuttgart, 1896.

See also: B. Jönsson in *Lund's Univ. Arsskr.* Vol. 38, 1902; Arthur W. Hill in *Ann. of Bot.* Vol. 19 and 21, 1905-1907, and Sir John Lubbock, *Contributions to the knowledge of seedlings*, 1892.

EXPLANATION OF THE LETTERS USED IN THE PLATES.

Cot.=cotyledon; H.=hypocotyl; R.=primary root; L¹=first leaf succeeding cotyledon; PL.=plumule; B.=bud; S.=scutellum; E.=epiblast.

EXPLANATION OF FIGURES.

Plate VII.

Fig. 19.	Seedling of <i>Platanus occidentalis</i> L.	.	.	Natural size.
" 20.	" <i>Liriodendron Tulipifera</i> L.	.	.	" "
" 21.	" <i>Sarracenia purpurea</i> L.	.	6 x	" "
" 22.	" <i>Dionæa muscipula</i> Ellis.	.	6 x	" "
" 23.	" <i>Catalpa bignonioides</i> Walt.	.	.	" "
" 24.	" <i>Ipomœa hederacea</i> Jacq.	.	$\frac{2}{3}$ of	" "
" 25.	" <i>Tilia Americana</i> L.	.	$\frac{2}{3}$ of	" "
" 26.	" <i>Aralia spinosa</i> L.	.	3 x	" "
" 27.	" <i>Claytonia megarrhiza</i> Parry.	.	.	" "

Plate VIII.

Fig. 28.	Seedling of <i>Aristolochia Serpentina</i> L.	.	.	Natural size.
" 29.	" <i>Sanguinaria Canadensis</i> L.	.	.	" "
" 30.	" <i>Dentaria laciniata</i> Muehl.	.	.	" "
" 31.	" <i>Podophyllum peltatum</i> L.	.	.	" "
" 32.	" <i>Erigeron bulbosa</i> Nutt.	.	.	" "
" 33.	" <i>Claytonia Virginica</i> L.	.	.	" "
" 34 and 35.	" <i>Ranunculus abortivus</i> L.	.	3 x	" "
" 36 and 37.	" <i>Gillenia trifoliata</i> Moench.	.	.	" "

GALL MIDGES OF THE GOLDENROD.

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Goldenrod or Solidago, a dominant characteristic American genus, represented by numerous species and varieties, supports an extensive fauna. This is particularly true of the Cecidomyiidae or gall midges dependent for sustenance upon members of this extensive genus. Every portion of the plant is subject to levy, including the blossom and leaf buds, the leaves, the young branches, the larger stems and even the subterranean rootstock, some species producing galls on several portions of the plant. This is particularly true of *Asphondylia monacha* which may breed in apparently unaffected florets, inhabits the small apical rosette galls on the branches of *Solidago graminifolia* and may also be found in peculiar oval cells formed between two adherent leaves on several species of Solidago. These latter galls are evidently caused by the parent depositing eggs between the loosely apposed leaves of unfolding apical buds. The activity of the larva causes the leaf tissues to fuse around the point of injury and, as a result, the affected leaves adhere even after the natural growth of the plant separates their bases and causes them to assume an approximately horizontal position. The

peculiar, long, fusiform galls of *Rhopalomyia fusiformis* and *Rhopalomyia pedicellata* may occur among the flower buds, arise from the leaves or even from portions of the stem, indicating that these two species in all probability have a somewhat extended breeding period. Goldenrod is a marked favorite with the genus *Rhopalomyia*, some 17 species existing at its expense and producing galls on all portions of the plant. Nine species of *Baldratia* may be reared from members of this genus all producing characteristic blister-like, apparently fungous affected, variously colored spots in the leaf tissues. The four species of *Lasioptera* reared from this genus live for the most part in goldenrod stems, while the peculiar *Camptoneuromyia adhesa* has been reared from the oval gall between adherent leaves noticed above, in connection with *Asphondylia monacha*. It is probable that further rearings would result in the discovery of additional species living upon goldenrod.

The following table of galls supplemented by extremely brief descriptions of the insects bred therefrom, will doubtless prove of service to any one interested in this subject. Members of the genus *Rhopalomyia* are usually rather large, reddish or reddish brown insects, easily recognized by the simple claws, the uni- or biarticulate palps and the stemmed antennal segments (in the male at least) bearing distinct whorls of hairs. The fraction following the number of antennal segments indicates the relative length of the stem of the fifth antennal segment, the length of the basal enlargement being the unit of length in every instance. Members of the genus *Lasioptera* and *Baldratia* are easily distinguished by the usually fuscous and white markings, and the dark scales along the anterior border of the wings, the first and second veins being very close to costa. The two genera are readily separated by the fact that *Lasioptera* has quadri-articulate palpi, while *Baldratia* has these organs uni- or biarticulate. Members of the latter genus breed almost exclusively in blister galls though a few may be found emerging from under the epidermis of nearly normal leaves. The genus *Camptoneuromyia* is allied to *Lasioptera* and easily distinguished therefrom by the strongly curved third vein which unites with costa near the distal third. The heavy bodied *Asphondylia* has long, cylindric antennal segments and a needle-like ovipositor.

Flower galls.

Gall greenish or reddish, subglobular, bud-like, 2 mm in diameter. Male, length 2.5 mm, yellowish red, 18-20 antennal segments, stem $\frac{1}{4}$.

Rhopalomyia racemicola O.S.

Gall green, cylindric, densely pubescent, 6 mm long. Male, length 2.5 mm, abdomen dark brown, 18-20 antennal segments, stem $\frac{1}{4}$. *Rhopalomyia anthophila* O. S.

Bred from an undescribed flower gall. Male, length 1.5 mm, abdomen light brown, 17 antennal segments, stem $\frac{1}{4}$. The female with 15 sessile antennal segments.

Rhopalomyia cruziana Felt.

Bred from apparently unaffected florets. Adult, length 4-5 mm, dark brown, the tarsi broadly white banded.

Asphondylia monacha O. S.

Bred presumably from apparently unaffected florets. Adult, length 4 mm, reddish brown, the tarsi fuscous yellowish.

Asphondylia johnsoni Felt.

Leaf galls.

Apical bud galls.

Gall green, composed of loose, convolute developing leaves.

Female, length 1 mm, abdomen dark brown, mid and posterior tarsi yellowish, 17 antennal segments.

Baldratia convoluta Felt.

Gall a loose pod of adherent leaves. Female, length 1.25 mm, abdomen dark red, 15 antennal segments.

Dasyneura folliculi Felt.

Apical rosette galls.

On *Solidago canadensis*.

Female, length 6 mm, abdomen dark brown, 24-25 antennal segments. *Rhopalomyia carolina* Felt.

Male, length 4 mm, abdomen fuscous yellowish, 21 antennal segments, stem $\frac{3}{4}$. Female 5 mm long.

Rhopalomyia albipennis Felt.

Male, length 3 mm, abdomen fuscous yellowish, 16 antennal segments, stem $1\frac{1}{4}$.

Oligotrophus inquilinus Felt.

On *Solidago canadensis* and *S. serotina*.

Male, length 2.5 mm, abdomen fuscous yellowish, 20 antennal segments, stem $1\frac{1}{4}$. Female, length 3-4 mm, abdomen fuscous red, 21 antennal segments, subsessile.

Rhopalomyia capitata Felt.

Male, length 1.5 mm, abdomen fuscous yellowish, 20 antennal segments, stem $1\frac{1}{4}$. Female, length 2 mm, 19 antennal segments, stem $\frac{3}{4}$.

Rhopalomyia inquisitor Felt.

On *Solidago graminifolia*.

Gall green, closely resembling that of *Oedaspis polita*.

Adult, length 4 mm, dark brown, the tarsi white banded.

Asphondylia monacha O. S.

Presumably bred from same gall. Female, length 1 mm, abdomen light yellowish, 16 antennal segments.

Lasioptera flavescens Felt.

A subapical or lateral oval gall. Male, length 2.5 mm, abdomen light yellowish, 17 antennal segments, stem $\frac{3}{4}$. Female, 15 antennal segments.

Rhopalomyia lanceolata Felt.

On *Solidago sempervirens*.

Asphondylia monacha O. S.

Galls attached to one, or at most, two leaves.

On *Solidago graminifolia*.

Gall greenish, red marked, ribbed, fusiform, sessile, length 6 mm. Male, length 2 mm, abdomen dark fuscous, 19 antennal segments, stem $\frac{3}{4}$. Female, length 3 mm, 18 antennal segments.

Rhopalomyia fusiformis Felt.

Gall green, red marked, fusiform, stemmed, length 13-14 mm. Male, length 2 mm, abdomen fuscous yellowish, 19 antennal segments, stem $\frac{1}{2}$. Female, length 3 mm, abdomen dark red, 18-19 antennal segments.

Rhopalomyia pedicellata Felt.

On *Solidago rugosa*.

Gall green, red marked, fusiform, length 1.6 mm. Female, length 2 mm, abdomen dull red, 17 antennal segments.

Rhopalomyia clarkei Felt.

On *Solidago canadensis* and *S. serotina*.

Oval galls between adherent leaves. Adult, length 1 mm, abdomen dark brown, 20-22 antennal segments.

Camptoneuromyia adhesa Felt.

Bred from similar galls. *Asphondylia monacha* O. S.

Bred from similar gall. Female, length 2 mm, abdomen silvery, 22 antennal segments.

Lasioptera argentsquamae Felt.

Blister-like galls occurring in leaf tissues.

Gall oval, black, on *Solidago graminifolia*. Male, length 1.5 mm, abdominal segments white margined posteriorly, tarsi banded, 16 antennal segments.

Baldratia carbonifera Felt.

Gall grayish brown, blue margined, on *Solidago squarrosa*. Male, length 1.5 mm, abdominal segments white spotted, 19 antennal segments.

Baldratia squarrosae Felt.

Gall rosy, on *Solidago rugosa*. Female, length 2 mm, abdominal segments white margined, posterior tars

narrowly annulate, 22 antennal segments.

Baldratia rosea Felt.

Gall oval, yellowish. Male, length 1.25 mm, abdomen light fuscous yellowish, 13 antennal segments.

Baldratia socialis Felt.

Female, length 1.5 mm, abdominal segments white margined, 16 antennal segments.

Baldratia fuscoannulata Felt.

Male, length 1.25 mm, abdomen reddish brown, 14-15 antennal segments.

Baldratia rubra Felt.

Gall lunate, yellowish. Female, length 2.5 mm, abdomen dark brown, 21 antennal segments.

Baldratia flavolunata Felt.

Probably from blister gall. Female, length 1.25 mm, abdomen deep carmine, 12 sessile antennal segments.

Dasyneura carbonaria Felt.

Elongate, brown leaf spot, possibly reared therefrom. Male, length 1 mm, pale yellowish, slender.

Lestodiplosis solidaginis Felt.

Male, length 1 mm, bright yellowish, slender.

Lestodiplosis triangularis Felt.

Stem galls.

On *Solidago graminifolia*.

Gall and adult described above.

Rhopalomyia fusiformis Felt.

Gall and adult described above.

Rhopalomyia pedicellata Felt.

Gall green, subglobular, near tip, 1.5 cm in diameter. Female, length 3 mm, abdomen dark brown, 19 antennal segments.

Rhopalomyia lobata Felt.

On *Solidago*, various species.

Gall a long, uniform swelling of the stem, near the tip of the stem. Male, length 2 mm, abdomen white spotted, 15-17 antennal segments. Female, 21-22 antennal segments.

Lasioptera cylindrigallae Felt.

Gall irregular, eccentric, usually near the base of stem. Adult similar to above.

Lasioptera tumifica Beutm.

Gall large, suboval, near the ground. Male, length 1.5 mm, abdomen reddish, 23 antennal segments, stem $\frac{2}{3}$. Female, length 4 mm.

Rhopalomyia hirtipes O. S.

Galls bulb-like, at base of stem. Male, length 2.5 mm, fuscous yellowish, 18 antennal segments, stem $\frac{3}{4}$. Female, length 3 mm, abdomen pale yellowish.

Rhopalomyia bulbula Felt.

Gall stout, cylindric, on rootstock. Male, length 2.5 mm, abdomen brick red, 19 antennal segments, stem $\frac{3}{4}$. Female, length 4 mm, abdomen dark brown, 18 antennal segments. *Rhopalomyia thompsoni* Felt.

NEW MEMBERS.

The following have been elected ordinary members of the Club at recent meetings of the Council:—

Mrs. Oakeley, Ottawa.

Miss L. E. Hunt, Ottawa.

Mr. J. E. Smyth, Ottawa.

Miss M. Haldane, Ottawa.

Miss A. E. Johnston, Ottawa.

Mr. A. S. Cram, Ottawa.

Mr. H. R. MacMillan, Ottawa.

MEETING OF BOTANICAL BRANCH.

Meeting held at the home of Mr. A. E. Attwood, January 4th, 1909. Present: Mr. A. E. Attwood, Prof. John Macoun, Rev. G. Eifrig, Messrs. R. B. White, G. H. Clark, W. C. Ewing, H. R. MacMillan, F. H. Reed, D. A. Campbell, T. E. Clarke, J. W. Gibson, Jas. M. Macoun, W. Bond, H. Groh, and L. H. Newman.

The subject forming the basis for the evening's discussion was as follows:—"The Meaning of some Common Plant Names." Mr. Attwood introduced the subject by explaining how he had come to question the significance of certain names by which some plants had come to be popularly known. The first case cited was that of the word "acorn." This was shown to have come from "oak-corn," or "oak-grain," corn coming from the Latin "cornu," a horn—something hard and horny. "Corn" is also the term by which the most important grain of any country is known. Some of the more striking illustrations of the unique and interesting derivations of certain names are found in the following:—

POMEGRANATE, from *L. pomum*, an apple; *granatus*, having many grains or seeds.

CATKIN, after the domestic cat, and *kin*, meaning little; thus, a little cat or pussy, hence, pussy willow.

CABBAGE, from the Latin *caput*, a head.

CAULIFLOWER, cabbage flower, or possibly a corruption of the French *choufleur*.

NINEBARK, meaning a shrub with many layers of bark, the word "nine" being commonly used to express an unlimited number, as "nine-days' wonder."

SNAKEROOT, derived from the supposed efficacy of the plant to which the name is applied in curing snake bites.

BUCKWHEAT, or "beech" wheat, the grain resembling a beechnut.

SPEARMINT may be a corruption of spiremint, so named on account of the spire-like inflorescence of this plant; or it may have been suggested on account of the spear-shaped leaves which it produces.

STRAWBERRY is a corruption of strayberry, applied to this plant on account of its straggling habit of growth.

Altogether about 150 plant names were examined into and some exceedingly interesting revelations were brought to light respecting their derivation and meaning. Since Mr. Attwood has agreed to deal with this matter in a special article at a later date, we shall not refer to it at greater length at present.

Before the meeting adjourned Mr. H. R. MacMillan of the Forestry Branch was asked to speak briefly on some subject of scientific interest to foresters. The subject chosen was "Why a Forester should be a Botanist." It was pointed out that it was necessary for a forester to be acquainted with all branches of botany—systematic, physiological, histological and ecological. "A knowledge of systematic botany," continued the speaker, "is necessary because in making hasty examination of the resources of any locality, the forester must depend upon the development of the flora and the species represented for suggestions as to the possibilities of the region. A forester's crop is trees. In order to understand thoroughly their processes of growth, the phenomena of their reproduction and the development of their different organs, a detailed knowledge of plant physiology is necessary. Plant histology is another branch of botany which plays an important role in forestry, especially in the study of the utilization of woods. During past years attempts have been made to manufacture wood pulp from inferior species of timber, notably balsam and the cheaper resinous pines. That processes have been discovered that make the use of these trees suitable for the manufacture of paper is due to the close study that has been made of the structure of such woods, the discovery of the differences in their inner anatomy which stands in the way of their utilization, and the invention of processes to overcome the difficulties."

"That division of botany known as plant ecology is simply forestry minus the commercial element. Forests are great plant societies and it is the forester's business to learn what are the natural conditions which combine to form the habitat in which may always be found certain forest types. Having ascer-

tained this, the forester decides upon the most important tree in that society and studies how best it can be reproduced. Forestry has for its object the reproduction of the most valuable species of timber on forest lands. Timber is reproduced by natural means wherever possible, by producing the conditions of light, soil and moisture upon which the plant, or tree in this case, thrives best. The problem is rendered more difficult by the fact that the conditions must be produced over large areas and without expense to the lumberman. For instance, spruce requires for natural reproduction shade, mineral soil and moisture. This tree is reproduced by so managing the lumbering operations that only the large trees are taken. The trees remaining furnish the shade and the seed; the logging operation tears up the ground, exposes mineral soil and a natural reproduction of young spruce is the result. If the reproduction is successful, it presupposes good botany; if it has not cost too much it has been good forestry."

After a short discussion on the remarks made by Mr. MacMillan, a number of very interesting botanical specimens were shown by different members of the Club. Some of these had been collected between 30 and 40 years ago from points around Ottawa at that time, but now covered by large public and private buildings. Mr. Eifrig showed specimens of charred apples and wheat, probably 3,000 years old, which he collected during the past summer at Lake Pfälikon, Switzerland, near the ruins of the homes of the pile dwellers. These people built their homes and storehouses on piles over the water, presumably for the sake of protection. Some of these were burned in course of time, and the charred remains precipitated into the water, where they sank, and, being beyond the reach of air and also protected through being charred, have been preserved all these years.

L. H. N.

REVIEW.

FISHES OF ONTARIO.

Check List of Vertebrates of Ontario Fishes. By C. W. Nash (Lecturer on Biology, Ontario Dept. of Agric.); Education Department, Toronto, 1908.

A new work on fishes by a Canadian author is a rare event, and doubly welcome on that account. As far as this work goes it will be very useful, and there will be a great demand for it. Probably few persons are like the late J. A. Froude, the historian, who declared that, owing to their cold clammy character,

fishes were repulsive to him. Most people find the finny tribes attractive whether gliding gracefully about in an aquarium, or tugging at the end of a baited line, or smoking hot on a dinner plate. Hence a book on fishes, especially if their metallic and varied forms be artistically depicted in illustrative plates, is coveted by everybody. It is surprising how deficient our Canadian literature is in this respect. We have almost unrivalled fish and fisheries, yet how few Canadian books to tell us about them. The issue of this handsome, well-illustrated work by the Board of Education, as one of the Series of Vertebrate Lists issued with the *imprimatur* of the Minister of Education, Toronto, is on every account notable.

Professor Ramsay Wright long ago prepared, as an appendix to the Ontario Game and Fish Commission Report, a description of economic fishes with plates, and it has been of high utility and value. The Fisheries Department of Ontario has also published more or less popular descriptions and plates of fishes in its annual reports. The most of the plates in these works have been reproductions of the well-known United States Fishery Bureau figures, which have been most widely and generously loaned by the Washington authorities. The late Mr. Montpetit, of Montreal, issued a book on our fresh-water fishes, but it had little scientific value.

Mr. Nash's book is very beautifully printed and contains 40 original drawings of fish, 32 being full-page plates and 8 small drawings in the text. The author has long been known for his skill as an artist and readers of the *Canadian Magazine* have been delighted with his sketches of birds and fishes. The present work shows him not only as an artist working *con amore*, but an accurate student of nature. The text is thoroughly scientific, and owes much, as all works on North American fishes must do, to the classic volumes of Jordan and Evermann. Had Mr. Nash relied more upon his own descriptive powers, as an ardent naturalist, his work would have had increased value. The technical descriptions by the famous American authors often hide rather than reveal the characters of the fish described. Mr. Nash might himself have described the common eel, for example, as "serpent-like in form, tail portion laterally flattened" but in this list the description of the genus runs "body elongate, sub-terete, compressed posteriorly, covered with embedded scales which are linear in form and placed obliquely, some of them at right angles to the others." The common bow-fin or lake dog-fish (*Amia*) has the "body oblong, compressed behind, terete anteriorly, head subconical anteriorly bluntish, slightly depressed, its superficial bones corrugated and very hard,

scarcely covered by skin, etc., but these features apply to many other genera. Most of the existing works on American fishes have this grave fault that the descriptions of genera and species are overloaded with details not sufficiently diagnostic and of no aid in distinguishing a fish from its allies. They might as well include the further information that each respective genus and species is "permanently aquatic in habit." Now for one or two detailed suggestions. In the general definition of the Pisces (p. 7) the word "vertical" should be added to describe the plane in which the unpaired dorsal and anal fins stand. "The median line of the body with one or more fins" is not sufficient. The fine old Canadian name "Maskinonge" should have been used in this book rather than the United States Mascalonge, which is a non-descript term invented by tourist anglers who were ignorant of the origin of the word "Maskinonge" a *voyageur's* form of the Indian Mas. "great," and Kenosha, "fish." Hence the short form "lunge" is wholly misleading and arose from confusion with the French term for the great lake trout, viz., *lunge* (i.e. 'longe,' the long fish). As to the Gizzard Shad (*Dorosoma*), which Mr. Nash states has worked its way into Ontario from the Ohio and Mississippi valleys, through the canals, it is a native Canadian fish, and was recorded by the late Edward Jack on the St. John River, at Fredericton, N.B., and no doubt occurs in the St. Lawrence and doubtless also in the Ottawa River, where it appears to be called "whitefish" and is caught by anglers at the foot of the Chaudiere Falls. The Mooneye (*Hiodon*) also occurs in the Ottawa River, and ranges, as Mr. Nash states, from the St. Lawrence to Lake Superior. The author speaks of the Green Pike (*Lucius reticulatus*) as not apparently common; but probably more widespread than appears. This prettily marked species is found as far east as the Kennebecasis River, N.B., and is scattered generally over eastern Canada.

The omission of some interesting species is to be regretted (such as Dr. H. M. Smith's *Coregonus osmeriformis*), especially as an introduced Pacific species, the Steelhead is described (p. 63) and twenty pounds specified as its maximum size. Jordan and Evermann name that weight, but specimens are plentiful in the Fraser River of twenty-seven up to thirty-six pounds weight.

The book is a catalogue of specimens in the Biological Section of the Provincial Museum and this limitation accounts for the exclusion of many species that should be found in a list of fishes of Ontario. Mr. Nash has found space not only for much faunistic information which the working naturalist will

appreciate, but he includes notes on habit, food and distribution. He holds that the salmon feeds in fresh water, and the Ontario *Salmo salar* must have done so, though the salmon migrating from the sea ceases to feed, there can be no doubt. In British Columbia rivers there is not food for the vast schools of ascending fish, and in all no doubt as spawning time approaches they fast and the stomach is clogged with dense tenacious mucus, a result of a kind of catarrh as described by Dr. Noel Paton in the Scottish salmon, and familiar too in the lake whitefish. Tastes differ and Mr. Nash, in stating that the lake ling or burbot is considered worthless as food, cannot be aware of the opinion of many fishermen that there is no better food fish, the meat being white and of good flavour like the cod or haddock, its nearest relatives. The fall-fish (*Semotilus corporalis*) is served up as whitefish at some Ontario Fishing Clubs notwithstanding Mr. Nash's view that as a food fish it does not take high rank. It has good table qualities however.

It is plain that Mr. Nash's work is full of interest, but fishermen will dispute many points until the end of time. If a second edition is called for, as will certainly soon be the case, the value of the plates would be increased by clearly outlining in each figure the three or four gill-cover elements, and by indicating as correctly as possible the exact number of rays in the unpaired fins. The author is to be congratulated on the very few misprints; but on p. 9 *Ichthyomyzon* should be *Ichthyomyzon*, on p. 63 *Cristimover* in two places should be *Cristivomer*, and on p. 118 *saggitate* should be *sagittate*. The name of the authority should also be appended to each scientific name. Finally, the occurrence of other examples of *Polyodon* (the paddle fish) in Canada than the two mentioned, was noted in an article in the OTTAWA NATURALIST in 1899, p. 153, and the addition of an index would be an improvement. It is a most useful, indeed valuable, and creditable publication, and all interested in Ontario fishes will feel indebted to its author.

C.

PURE WHITE CALYPSO BOREALIS.

It may be of interest that a pure white Calypso was obtained by me at Thetis Lake last spring. I am not aware that such a specimen has previously been reported. I transplanted the bulb with the object of ascertaining whether the habit was constant but I fear that the hordes of robins which insisted upon scratching up the moss covering have destroyed the bulb.

J. R. ANDERSON, Victoria, B.C.

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NOTES ON A THREAD-LEGGED BUG.

BY H. F. WICKHAM, IOWA CITY, IOWA.

In about twenty years collecting at Iowa City, I had never met with a fully grown specimen of the wonderfully emaciated insect that goes by the name of *Emesa longipes*, De Geer. Therefore was much rejoicing when my wife picked up one from a somewhat dusty corner of the bedroom floor, at a time when the house was undergoing repairs and subject to the passage of many feet. For twelve months this remained a solitary treasure, but in November of 1907 another was taken on a window, and during the winter a third specimen was found dead on a fly screen at the opposite end of the cellar. Suspicion became strong that we were entertaining a colony unawares, and future developments have fully justified this impression.

Last September, on the second day of the month, a neighbor living next door came to see me, bearing one of these curious beasts, which he had found crawling on his clothes. While we were seated on my porch discussing previous finds, I holding this latest acquisition in my hand, he called my attention to another crawling along my arm. "I wonder if they fly," he said, but I replied that it seemed unlikely since the insect was so ungainly and the wings so very small in proportion, the thoracic segments showing none of the structure common to many small-winged insects of good flight. Scarcely had I made out my case, when another of the bugs came along, in full flight, only two or three feet in front of our faces and alighted on one of the pillars where it was easily caught. This gave me plenty of specimens for cabinet purposes and for class demonstration, so when still another female came to hand I put her in a box where she would have plenty of room to run, if she so desired, and waited to see what would happen. Running, however, was not her forte, she preferred to stand, rocking up and down on her long threadlike middle and hind legs, holding the shorter raptorial front pair, with the tibiae folded back, out in front of her, and any urging only forced her into a slow walk. She ate

nothing, perhaps of necessity, for I do not recollect that I gave her any room-mates, but before long she began to lay eggs at random in her prison, fastening them by one side to the walls of the box. In all she laid about a dozen, then died. The eggs bore a close resemblance to small caraway seeds, being curved in about the same way, the convex side, by which each was attached, smooth under ordinary powers of the hand lens, the rest of the surface ornamented with about ten or twelve longitudinal rows of scale-like projections. One end of the egg was rounded off, the other bore a structure like the lid of a jar with a tapering peg in the middle. After a few days the eggs were carefully detached from their moorings and put in a pill box on my library table where they were duly forgotten for a space of several weeks.

One evening in the middle of November, while looking for some specimens that had been mislaid, I opened the box and was pleased to see the first little bug out of the egg, a miniature of his mother, even to the rocking motion with which he responded to my letting the light into his dark abode. Next day, two more came on the scene, and the day following brought out a fourth. In all cases the infants had escaped from the egg by pushing off the handled lid, which however often remained attached to the shell as by a hinge. The fifth bug died when half way out, and no more got even that far, so I still have several eggs to serve the original purpose of mounts for microscopic slides. The young animals were almost perfectly colorless and all died within three or four days, though I had hoped that the stronger would manage to keep alive at the expense of the more newly born until a few mosquitoes or gnats could be obtained from the cellarway which furnishes that sort of entomological material all winter.

Some of the little bugs have been mounted in balsam on slides and, when projected on a screen by means of the microscope attachment of our stereopticon, show the characteristic elongation of antennae, body and legs very nicely. The front legs have the same spiny teeth as in fully grown individuals showing that the insect pursues a predaceous life from birth. Their history ought to be fairly easily followed by any one who has the fortune to find females in the fall of the year. A part of the eggs might be kept in a warm room as mine were, if provision were made in advance for supplying the young with food when they appeared, but it would probably be better to keep a good proportion of them in a cool cellar until spring, this would doubtless retard hatching until that season, most likely the natural period of appearance.

Most of our texts and reference books contain only short notices of *Emesa longipes*, but Mr. P. R. Uhler, in the Standard Natural History, has given a more complete account. He says, "When lodged on the twig of a tree or bush it has the curious habit of swinging backwards and forwards like some of the long-legged spiders, such as *Phalangium*. The species is quite common in many parts of the United States east of the Rocky Mountains, from Massachusetts to Florida, and west to Central Texas. In Maryland its principal home is in the young pine trees where it may be seen with its two fore legs placed close together and stretched out in front. Occasionally it leaves the trees and takes shelter in sheds, outhouses and barns where it may be seen overhead swinging by its long legs from a rafter or the lining of the roof. The immature form may be found roaming over the trees during early summer, but by the middle of August it acquires the organs of flight and becomes a fully developed adult. We do not yet know where it deposits the eggs; but from analogy we are led to believe that these are glued to the twigs of bushes and trees." Mr. Summers, in a paper on the Hemiptera of Tennessee, writes that it may be seen in old stables and outhouses, hanging from the rafters or crawling slowly about in search of flies and other insects which it seizes with its front legs. Dr. Howard, in the Insect Book, says that one species frequents spiders' webs and robs the spiders of their prey.

THE LATE DR. JAMES FLETCHER.

A VOICE FROM THE PACIFIC.

The Memorial Number of the OTTAWA NATURALIST, whilst containing many touching tributes to the memory of our dearly beloved friend, is conspicuous by the absence of any from this side of the Dominion. I, therefore, ask the privilege of contributing a few words to the memory of one of whom it may be truly said "*Amicus humani generis*."

My acquaintance with Dr. Fletcher, whilst of not as long standing as some others, dates back to the time of his first visit to the West in the very early eighties, when we at once became true and fast friends which subsequent meetings only served to accentuate; for, as it has been said of him, "to know him was to love him." Our work both in our public and private capacities has been carried on, certainly to my own advantage, and with mutual pleasure, and I can unreservedly say that what little I know of Natural History is due to the teachings of our

lamented friend. Our work in connection with our respective public positions took us all over the settled portions of British Columbia, excepting the extreme north, and during these journeys not only under his guidance were we able to collate information of invaluable character, but were enabled to accomplish many excursions in search of specimens relating to our work. Amongst the many points visited I may particularly mention Mount Arrowsmith, Mount Benson, Mount Che-am and the Rockies and Selkirks—points of which Dr. Fletcher to the last spoke with enthusiasm, and even as late as October last, suggested a further visit to his beloved Che-am. It was here that he captured his first specimen of *Erebia vidleri*, to his infinite delight, as he had long sought in vain for its habitat.

The astonishing activity of Dr. Fletcher, his untiring energy, his keen appreciation of the beauties of Nature, his quickness to observe anything new or interesting, his unfailing good humour, even under the most adverse circumstances, his close observance of the idiosyncracies and habits of men and animals, his love of the young and desire to impart knowledge and create a liking for nature study, and his thoughtfulness for the comfort and pleasure of others, all contributed to making him the general favorite he was and rendering every moment enjoyable which was spent in the company of this truly great man. Illustrative of his indefatigable activity I may mention the following incident: After a hard day's tramp, camped under a clump of hemlocks on a beautiful grassy slope of Che-am, and after our evening meal and pipe, about the time that one's thoughts are of bed, he proposed a walk in the moonlight to the top of the ridge. Tired as I was, I felt loth to leave the camp fire, but I consented, albeit somewhat reluctantly. The result amply repaid us; the whole of the surrounding snow-clad peaks including Mount Baker lay clothed in the soft moonlight seemingly towering above us, the whole a scene of surpassing beauty. We retired to our rest impressed with the grandeur of nature and the littleness of human efforts in comparison.

In all his visits to our home in Victoria he ever displayed the greatest pleasure in everything appertaining to our home life, and was ever ready to contribute to our happiness by those acts of kindness for which he was so justly celebrated. Only on his last visit, rather than I should be detained by duty, he undertook to read proofs for the press, which he did late into the night, whilst the rest of the company present enjoyed themselves in another room, in order that I should be able to accompany him. This, our last trip together, was taken the next day to the Dominion Biological Station at Departure Bay, of

which the Rev. George W. Taylor, another life long friend of Dr. Fletcher's, is curator, where we spent a couple of days. On parting from him, he with his usual thoughtfulness, insisted on carrying my case to the waiting conveyance, as he considered I was still an invalid. Little did we think it was to be our final parting.

I can bear witness to the inestimable value of the assistance he afforded this province in all those questions affecting the welfare of the agriculturist and the people generally; that to the other parts of the Dominion and to mankind in general are but too well known and have been dilated upon by abler pens. And now arises the question, how can his place be filled? In our hearts at least there is a void which we feel that time can but partially cure, and in bidding farewell to one who has so endeared himself to all and whose life was so successfully and disinterestedly devoted to the welfare of his country, we may well say,

"He so sepulchred in such pomp dost lie
That kings for such a tomb would wish to die."

J. R. ANDERSON.

Victoria, B.C., 26th January, 1909.

EPIGÆA REPENS IN WATERLOO COUNTY.

As all references to the habitat of *Epigæa repens*, L., I have seen, have been "sandy or rocky woods especially under evergreens," a description of the conditions under which it grows wherever I have found it in Waterloo County may be of interest. I have collected it at three stations and always in cold cedar swamps with *Ledum groenlandicum*, Oeder. At one large swamp where it is abundant it is difficult to reach while in bloom, owing to the inundated condition of the swamp in spring, but although very wet in its surroundings it is mostly found on hummocks, old rotten logs, and more elevated places such as is mostly found around the roots of cedars. Nothing can better describe the conditions under which it grows than the following list of trees and plants that are immediately associated with it: *Ledum groenlandicum*, Oeder; *Dalibarda repens*, L.; *Chiogenes hispidula* (L.) T. and G.; *Cypripedium reginae*, Walt.; *Tiarella cordifolia*, L.; *Caltha palustris*, L.; *Picea mariana* (Mill) B.S.P.; *Thuja occidentalis*, L.; *Taxus minor* (L.) Britton, and *Larix laricina* (DuRoi) Koch.

W. HERRIOT, Galt, Ont.

CARIBOU ON THE QUEEN CHARLOTTE ISLANDS.

News comes from Massett, Queen Charlotte Islands, that some Indians have just arrived there from the interior of Graham Island, bringing with them the heads and hides of three caribou. They stated that they had also seen a calf, which, however, escaped. A letter just received from the Rev. W. E. Collison confirms this report, and encloses a photograph he had himself taken of the animals.

The British Columbian Government had already despatched the curator of the Victoria Museum to look for deer on the Queen Charlotte Island, but the specimens just referred to reached Massett before his arrival there. He will, however, doubtless secure them, and before long we shall have a specialist's report on them. They presumably belong to the species described by Mr. Ernest Thompson Seton, in the OTTAWA NATURALIST for February, 1900, as *Rangifer dawsoni*.

At last, then; the long debated question as to the existence of caribou on the Queen Charlotte Islands has been settled in the affirmative. The present writer, whose intimate acquaintance with the Islands extends nearly over twenty years—eight of which he resided at Massett—has been amongst those who disbelieved in the existence of caribou there. It seemed so improbable that such large and active animals could have existed so long in so comparatively small an area, and yet remain unseen; for, if we except the fragment on which Mr. Thompson Seton founded his species, which seemed to have a doubtful history, it is a well-known fact that no caribou have been killed during the period just named, nor are there any animals on the Islands likely to prey on caribou. Even if only moderately prolific, they must in this period have increased to such an extent that they could hardly escape notice. However, they are there, and they must be another example of the truth of Darwin's statement in his Origin of Species: "Where any species becomes very rare, close interbreeding will help to exterminate it. Authors have thought that this comes into play in accounting for the deterioration of the aurochs in Lithuania, of red deer in Scotland, and of bears in Norway."

It is comforting to see that the provincial government have passed an Order in Council prohibiting the hunting, killing, or taking of caribou on the Queen Charlotte Islands. One only hopes that the order will reach Massett in time to prevent the Haidas making an indiscriminate slaughter of what remains of these interesting animals.

• J. H. KEEN.

THE BURROWING OWL (*CUNICULARIA HYPOGÆA*).

This interesting bird is at the time of writing very rare in this district, although some ten or twelve years ago it was to be found in certain spots, living in pairs as a rule, although I knew of one colony of some dozen individuals living together in an assemblage of burrows on the edge of a tract of barren prairie land, the soil of which was so strongly impregnated with alkali that the only vegetation was a few scattered tussocks of coarse grass and stunted shrubs, among which the owls had taken up their quarters. The birds might be seen walking about among the mounds at the entrance of their underground dwellings, taking short flights over the prairies, and on the approach of danger retreating into the safety of the burrows.

These owls are abroad at night as well as during the day, and at that time utter a peculiar cry, of two notes repeated at intervals. The sound may be heard for a considerable distance in the darkness, but if one attempts to catch sight of the performer by creeping up to the spot from which the sound comes, it ceases suddenly, the bird no doubt seeking safety underground.

I dug up the residence of a pair of these birds and found a tunnel running in a sloping direction to the depth of some three feet at the end of which was a chamber roughly oval in form, with no lining of grass or other material, and on the floor of this lay the bodies of four mice, the head of each one had been devoured, the bodies we must suppose were being kept against days of scarcity. This seems to me a peculiar habit, for a carnivorous bird, especially as there were no young to provide for.

This interesting colony has been long extinct, and the solitary pair which had their home near the spot for a few years, have long since deserted it, owing to the ploughing up of their building—or perhaps I should say, digging site.

Sometimes in the evening the call note may still be heard, but it comes from a long distance, and is a rare sound.

E. P. VENABLES, Vernon, B.C.

MEETINGS OF THE COUNCIL.

January 26th—The following members in attendance: the President, Mr. A. E. Attwood, Miss Q. Jackson, Miss E. E. Curry, Rev. G. Eifrig, Messrs. A. Halkett, A. McNeill, H. H. Pitts, L. H. Newman, and T. E. Clarke.

The following were elected to membership:—

Mr. Thos. McMillan, Seaforth, Ont.

Mr. J. A. Munro, Toronto.

Hon. Mrs. O. H. Lambart, Ottawa.

Mr. G. Michaud, Ottawa.

On request of the Natural History Museum of Hamburg it was decided to exchange publications with the Museum.

The Publishing Committee were requested to report at the next meeting of Council on the state of that portion of the Library now stored in the basement of the Normal School and to make some recommendation as to what should be done with it.

February 9th—Present: the President, Mr. A. E. Attwood, Messrs. A. Halkett, A. Gibson, C. H. Young, E. E. Lemieux, A. McNeill, L. H. Newman and T. E. Clarke.

Miss W. K. Bentley, Ottawa, was elected a member of the Club.

The Publishing Committee presented a report showing progress on the work of dealing with the Library question.

T. E. C.

BIRDS OBSERVED AT OTTAWA, ONTARIO, WINTER 1908-1909.

BY G. EIFRIG.

The present winter has been a very successful one for Ottawa, from an ornithological point of view at least. While it has not been an unqualified success from the standpoint of the winter itself, inasmuch as the essentials of winter hereabouts, cold and snow, are remarkable for their low quantity, and therefore coal-dealers presumably will pronounce it a dismal failure, yet the birds and especially the true Canadian winter birds have taken to our fine capital city in greater number and variety than in many years since and probably for many years to come.

To begin with the rarest, on December 13th a flock of about thirty Bohemian Waxwings or Chatterers (*Ampelis garrulus*) took up their residence in the Metcalfe-O'Connor Streets' district where they feasted on the berries of the many mountain-ash trees to be found in that part of the city. They usually divided into small flocks and spread out over this area, and then they joined forces again for the night. From about January 12th, however, they concentrated themselves at the corner of Slater and O'Connor Streets, where a small rowan tree offered berries to them that seemed to be more to their taste than any others. Here and on neighboring larger trees they

could be seen every day, sometimes only a part of the flock and then again all, until the 24th of January, when the queer rain and subsequent freezing coated everything thickly with ice. They were, however, seen as late as February 22nd. This and the species next mentioned are about the two most irregular and erratic birds we have. Their coming and going follows no recognizable rule or law; they are in no wise migrants, but only aimless wanderers. They may come here next winter again, in greater numbers than in this, or they may not again turn up for many years. Their breeding range and habits are but imperfectly known. In winter they may turn up anywhere, but in summer they have only been seen in the stunted spruce stands around Hudson Bay; in the Mackenzie Basin at Great Bear Lake; at the sources of the Athabasca River and high up in the Rocky Mountains in British Columbia, and at Banff and Canmore. They make their nests of moss, etc., well up in pines and firs. It is a beautiful bird, much like the Cedarbird, only larger and handsomer.

On February 7th a flock of the rare and pretty Evening Grosbeaks (*Hesperiphona vespertina*) put in an appearance in the Somerset-Cartier Streets' neighborhood. While they are not at all averse to rowan berries, they prefer the seeds of the Manitoba or ash-leaved maple (*Acer Negundo*). There were thirteen of them, and the males in their handsome yellow, white, black and dark olive-brown plumage certainly presented a fine sight. They would often alight on the roofs of houses or sheds and eat snow and perhaps clean themselves in it. The females and young are much less conspicuous, being a uniform gray over the head and body, the wings being black and white, and a tinge of olive on the neck and breast. A flock of seven was seen on the Experimental Farm. In their proclivities for apparently aimless, erratic wandering, this species is just like the Waxwings, and they also share the same breeding range. Bird-lovers here consider themselves fortunate in having seen these two rare species in one winter, which perhaps will not happen again in a life-time. Many observers in other places look for these birds diligently all their lives and never see them.

Besides these, our more common, but none the less equally welcome winter visitors, the Pine Grosbeaks (*Pinicola enucleator*), are here again in numbers. They too are most numerous in the same general district, where the first two stayed. When one sees below a rowan tree debris of berries lying about, he may be sure that some of these birds have been there eating, or are still there. When eating, which they nearly always do, they are very silent, and it sometimes takes a good hard look to discover them

in the trees, even when these are without leaves. These birds were seen as late as February 25th.

The White-winged Crossbill (*Loxia leucoptera*) was here in great numbers late in fall and some at least must have remained for the winter, because on February 8th, a part of one was found at the Experimental Farm by Mr. Groh. The other part had just been eaten by a Northern Shrike. This cross-bill is in its wanderings and appearances almost just as unreliable and erratic as the first two species named.

Of similar habits, only not to the same degree, are the Redpoll (*Acanthis linaria*) and the Pine Siskin (*Spinus pinus*). Both of these little birds have been here this winter in more than usual numbers. Even three of the rare Hoary Redpolls (*A. hornemannii exilipes*) were seen January 24th in a yard on Wurtemberg Street.

An extremely rare freak in nature was seen by the writer on January 19th on Rideau Street. In a flock of English Sparrows nearly at his feet, was a red English Sparrow. Nor was the red over only a small area, or of an indistinct, brownish hue, but very bright and general. It was a crimson shade below, like the red of the male Pine Grosbeak, and a brick-red like the American Crossbill on the back. Otherwise, in size, build, shape and behavior, he was like the English Sparrows in whose company he was; also, the wings and tail were like those of this far too common denizen of our streets. For several reasons it is not likely that this bird was a hybrid between the common sparrow and, say the Purple Finch or one of the Crossbills. It must, therefore, have been a case of erythrism, like there are cases of melanism and albinism. In fact there are usually some albino or partly albino English Sparrows to be seen in winter in our streets, as during this winter, when some with large patches or a collar of white have been seen near By market.

A first record for Ottawa is the occurrence, November 2nd, of several King Eiders (*Somateria spectabilis*). Four of these were shot and mounted. On December 2nd another flock of 75, mostly young ones came up the river and stayed for a while near some of the boathouses on the river. Ten of these were shot by the ever present gunners. The remainder went up the river and were observed as far as Pembroke, Ont.

Finally, those mysterious wanderers from far northern shores, the Brunnich Murre (*Uria lomvia*), appeared again, December 1st, when six were seen. On the 19th of the same month they came in large numbers, about 500 being seen winging their way up the river. Many of course fall victims to the numerous gunners, with which our river seems to be lined, in and out of

season. The case of this bird is a very perplexing one. Their coming is no migration in the common sense of the word. In fact, they are lost the moment they leave salt water. All that come here and are not shot perish of starvation as they do not seem to be able to find suitable food in any river or lake. Why they should year after year persist in coming up here to perish is hard to say.

And, to cap the climax, the Robin (*Merula migratoria*) has been with us nearly all winter. A little flock of four was seen in various places up till Christmas, and then took up its headquarters in the trees around the City Hall, where they could be seen during even the coldest days we have had. Certainly a novel sight for Ottawa.

Also, a Meadowlark (*Sturnella magna*) was seen in the middle of this winter, namely January 10th, at the Rifle Range. Why these birds, which are not supposed to winter here, stayed here this winter, or came here, is hard to tell. Did they know the winter would be a mild one?

MEETING OF THE BOTANICAL BRANCH.

Held at the residence of Mr. E. R. Cameron, 21st December, 1908. Present: Prof. J. Macoun, Dr. Ami, Rev. G. Eifrig, Dr. Blackader, and Messrs. Cory, E. R. Cameron, J. M. Macoun, W. T. Macoun, Attwood, Whyte, MacMillan, D. Cameron, Jacombe, Witten, Bond and Groh.

The first part of the evening was devoted to some subject of general botanical interest. Prof. Macoun exhibited a copy of the newly-issued edition of Gray's Manual, and gave some explanation of the need which existed for such a work, as well as some interesting information about the methods and painstaking labor by which it had been brought to its present revised form. In order to cover a more natural floral area than heretofore, it was necessary to make exhaustive explorations of the Eastern portion of Canada so as to include its flora. Likewise, in order to bring the work into line with recent ideas of classification and the latest findings of botanical science, the sequence of the families has been entirely changed, and changes in nomenclature have been adopted. Prof. Macoun referred to Britton and Brown's botany as an effort to forestall this work, but considered that this was such a superior and admirable book that it should be everywhere welcomed.

Prof. Macoun also spoke about the Ottawa Flora which he is engaged in preparing. He invited all members who have

collected in the Ottawa district, to furnish lists of plants in their collections, so that every reliable record might be included and due credit be given.

The remainder of the evening was given up to a discussion of forestry methods, which was also introduced by Prof. Macoun. He held that the hope of re-afforestation depends upon following Nature's own method. In Nature, uncovered areas first grow up to small stuff of the poplar type, which after a time is gradually displaced by conifers and other valuable trees. Forestry was astray in its efforts if it did not recognize this principle.

In reply Mr. MacMillan, of the Forestry Dept., agreed that Nature's methods must be studied, but maintained that those are the lines now being followed in tree planting. Tree planting, however, is only a very insignificant part of forestry in a country like Canada. The forestry problem here is such a large one that for the present little can be undertaken beyond studying the conditions with a view to properly husbanding and protecting the existing forests, by scientific lumbering operations and fire protection. Fires are the greatest scourge of the forest, and carelessness and indifference are largely responsible for the loss from this cause. Settlers are willing that they should run their course, so long as their personal property is not endangered. The fire which destroyed Fernie was burning in the woods for a month before that disaster. Vancouver Island will soon be without forests and without vegetation if fires are allowed to burn unchecked, as they were last summer. Mr. MacMillan remarked that there is no timber of export size on the east slopes of the Rockies to-day. Prof. Macoun stated that in 1879 from Mattawa to Winnipeg, and from Kananaskis to Vancouver was continuous forest, where now only isolated patches remain.

The proof sheets of a list of Herbaceous Perennials at the Central Experimental Farm were shown by Mr. W. T. Macoun, and Mr. Eifrig exhibited a number of European plants collected during the past summer.

H. G.

AN EARLY BAT.

A specimen of the Brown Bat was captured by Mr. Walter Venner, of Quebec, as it was flying about the corridors of the Parliament Buildings during the evening of February 24th. The warm weather of that or the previous day had probably caused it to leave its winter quarters. This species *Vespertillo fuscus*, Beauv., is common in the vicinity of Ottawa, but the occurrence of an active specimen at this season of the year seems worthy of record.

J. M. MACOUN.

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